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SOCIOECONOMIC STATUS DIFFERENCES IN MOTHER-CHILD VERBAL INTERACTION PRACTICES AS RELATED TO THE SYMBOLIC MEDIATORY PROCESSES OF THE CHILD

by

© MALCOLM GORDON ELEY

A THESIS

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled "Socioeconomic Status Differences in Mother-Child Verbal Interaction Practices as Related to the Symbolic Mediatory Processes of the Child" submitted by Malcolm Gordon Eley in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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ABSTRACT

Of particular interest for the present study was the hypothesized relationship between the functional use of language by the mother in the mother-child dyad and the development in the child of mediatory processes. Findings have been reported in the literature that purport to show that upper SES mothers, when involved in teaching their children, make a greater functional use of language in the provision of labels, the focusing of attention, and the general directing and structuring of the child's task performance than do lower SES mothers. Such use of language by the upper SES mother could be expected to expedite the child's development of mediatory processes.

Seventy-five upper SES and 75 lower SES mothers and their five- to six-year-old children were videotaped playing a simple block sorting game. Each mother was scored on such aspects of her language use as the provision of labels for the sorting attributes, the focusing of the child's attention, and the making of global rule statements concerning the overall format of the game. On the basis of these language use scores, the mothers were ranked within SES groups.

One hundred and twenty eight children were then selected to form four basic groups of 32 subjects each; that is, children of relatively high and low language

scoring mothers within each of upper and lower SES. Each of the children was then administered two visual discrimination shift tasks, either extradimensional or intradimensional, both under the total change paradigm. Half the subjects in each basic group were administered a training condition between the shift tasks consisting of a short film showing an adult modeling one successful procedure for solving visual discrimination problems.

The findings from the data did not support the predictions made. No substantive SES differences were found for either the mother-child sorting task, or the children's discrimination shift tasks. On the discrimination shift tasks, the ID shift was easier than the ED for all four basic groups of child subjects. Compared to the practice effects of performing the shift tasks, the intervening training sequence had negligible if any effect.

The findings were interpreted as indicating that the children from all four basic groups had exhibited evidence of mediatory processing. The lack of SES differences in the children's shift performances and in the mothers' language-tutoring practices was interpreted as reflecting a lack of socioeconomic extremes in the Edmonton, Canada, setting. The fact that there were large within-group variances in the children's shift performances was taken as indicating the possibility that there were in fact

differences in the language cum child-rearing practices of the mothers, but that, first, such practices were likely not neatly nested within SES, and second, that procedures such as those used in the mother-child sorting task of the present study were likely not effective as a means of yielding valid reflections of these practices.

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CHAPTER ONE

Introduction and General Theoretical Review

Glaser (1970) notes that educators and psychologists should be concerned in their research with the elucidation of those skills currently possessed by different individual children. Such knowledge could then be applied to the development of instructional programs maximally suited to the varied individual skill profiles of different students. In this way, any one student could, theoretically at least, be instructed on any specific topic in the most appropriate manner.

One of the most pervasive of individual difference variables is socioeconomic status (SES). It has been shown to relate to intersubject performance differences over a wide and varied range of cognitive tasks. Consequently, in light of the point made above regarding individualized instruction, SES research should be of special significance to the educational psychologist.

A better understanding of, first, the cognitive task performance differences between children of different SES, and second, the functional relation to these performance differences of the various social and environmental factors inherent in SES, would be useful in at least two educational and psychological problem areas. First,

developmental comparisons between different levels of SES would give helpful clues as to the important causal variables in the development of specific cognitive skills. Second, the study of SES differences in child-rearing practices, familial interaction patterns, and other related socio-familial variables, would be of assistance in the design of remedial teaching programs for the cognitively less facile child. It is with such general purposes that this current study is concerned.

Assumed Model of Behavior

The basic psychological model underlying this study is one hypothesizing two broad levels of behavior. Both White (1965) and Bourne (1966) have argued for such a model. The first level of behavior may be described as involving associative automatic response patterns, being the result, as White argues, of learning from uniform and often repeated stimulus situations. The second level of behavior is of a cognitive nature, involving mediatory processes. Just which behavioral level will be exhibited by an individual at any one instance will depend on both the complexity of the task and the previous learning history of that individual. The more complex the task, the more its successful completion would require mediatory processing behavior (Bourne, 1966). The more often the

individual has experienced similar tasks previously, the greater would be the automatic nature of the response (White, 1965).

Evidence from association and discrimination learning studies indicates that the two levels of behavior may be linked temporally (White, 1965). Given any one stimulus situation, the tendency would be for the most dominant first level response to be exhibited. The operation of the second level would depend upon the ability of the individual to inhibit this initial associative response.

The work of Dulany (1962; 1968; Dulany & O'Connell, 1963) indicated that the operation of these level two cognitive responses may involve a number of distinct symbolic response processes in interaction. Dulany suggests that the behavioral intention of an individual in any one situation is a function of, among other things, the hypotheses held by that individual as to the reinforcement distribution criteria, and as to the behavioral form of the correct response.

Evidence for such a two tiered structure of behavior has been provided by Weir (1964) who summarized the results of a number of probability learning studies over a range of subject ages. He found that the most successful subjects in terms of response correctness were the three- to seven-year-olds and the eighteen- to nineteen-year-olds. From an analysis of the response patterns Weir

concluded that the youngest subjects were using a maximizing method of response, without any uniform pattern, whereas the remaining subjects were using definite scanning patterns. The difference between the eighteen- to nineteen-year-olds and the "middle aged" subjects was that the latter failed to modify their patterns as a result of response correctness feedback. Weir argued that the ability to generate response strategies perhaps develops earlier than do the information processing skills used in response modification.

The position argued in this study is that SES differences in cognitive performance derive from differences in the degree of sophistication at the second level of behavior. As a result of inadequacies in their learning environments lower SES children will have failed to develop the necessary mediatory response strategies that would have otherwise enabled them to approach complex information processing situations successfully.

Cognitive Development

Inherent in the position noted above is the theoretical stance that cognitive development is basically a learning process in which the child's behavior is shaped be external factors. Such a stance has been taken by a

number of writers (Fowler, 1962; Freeberg & Payne, 1967; Gray & Miller, 1967; Staats, 1971) who have reviewed the research on childhood cognitive development. All point out the importance of early cognitive stimulation, and all note the repeated finding that language plays a very significant role.

The intellective and problem solving behaviors of the child have been related to the use of abstract concepts by the mother in her categorizing and integrating uses of language. Mothers of children high in verbal IQ have been found to give more general verbal stimulation and voluntary assistance to their children, than do mothers of children low in verbal IQ.

Walters and Parke (1964; 1965; Walters, 1968) have similarly highlighted the importance of early cognitive stimulation. They point out that since most learning is mediated by the sensory distance receptors, the early development of an attentive orienting response in the child is of critical importance for that child's later cognitive growth. Since much infant attentiveness is initially the result of operant and respondent shaping via visual-aural stimulation during feeding and caretaking, any differences in such child-rearing practices are likely to be reflected in the child's subsequent cognitive development.

Evidence from anecdotal studies of precocious

children and successful adults has similarly stressed this link between early childhood training and experience, and later cognitive skills (Fowler, 1962). Roe (1951) interviewed a number of successful scholars in the physical, biological, and social sciences. She found significant parallels between the present cognitive skills of her subjects and, first, their early interests, and second, the occupations of their fathers.

Cognitive Development and SES Background Differences

Many writers (Bronfenbrenner, 1958; Reese & Lipsitt, 1970; Sears, Maccoby & Levin, 1957) have summarized the work on SES family environmental differences. The major findings have been that in contrast to her lower SES counterpart, the upper SES mother is more permissive in her child caring, tends to rely more on reasoning and other nonphysical disciplinary methods, and seems to be primarily concerned with the intent of the child rather than its overt behavioral conformity. Also, the disciplinary techniques of the lower SES parent seem to be typically chaotic and random in their application, whereas those of the upper SES parent seem to be applied in a more uniform and regular manner (Lawton, 1968).

Kohn (1963) draws a parallel between the occupations of the different levels of SES and their respective child-

rearing practices. He notes that lower SES occupations tend to be of a manual, subordinate nature; involving things and objects, and subject to a relatively large amount of standardization. In contrast to this, upper SES occupations usually involve a greater amount of flexibility, are often concerned with symbols and abstractions, and they frequently deal in interpersonal relationships. Kohn argues that it is at least feasible that the values and typical modes of behavior learned by the parent in the occupational setting might be transferred into the home in the form of child-rearing practices.

The argument elaborated in this study is that as a result of learning and modeling mechanisms (Bandura, 1969; Bandura & Walters, 1963; Skinner, 1953; 1969; Staats & Staats, 1963) such differing child-rearing practices, with their inherent variations in emphasis, will result in cognitive development discrepancies between children from different levels of SES. Evidence that such learning and modeling mechanisms are indeed operative has come from a number of sources. Bandura and Kupers (1964) for instance, demonstrated that seven- to nine-year-old children would imitate the self-reinforcement patterns of adult models in a game situation. In a study requiring four-year-olds to teach a previously learned puzzle to three-year-old peers of the same race and SES, Feshbach and Devor (1969) showed

that upper SES teacher-subjects exhibited more instances of positive reinforcement than their lower SES counterparts; a finding characteristic of the differences in child-rearing practices between the two levels of SES.

In a study the findings of which are typical of those of other studies to be reviewed in detail later, Werner (1969) found a significant positive correlation at age 20 months between female infant IQ (Cattell's Infant Intelligence Test) and each of father's IQ (California Test of Mental Maturity), mother's IQ, father's education, mother's education, and father's occupation. Similar but less extensive results were also found for male infants of the same age. At age 10 years, there were significant positive correlations for both boys and girls between child IQ (Primary Mental Abilities Test) and each of SES, the educational stimulation rating of the home, and the emotional stability of the home, as well as each of those variables found to relate at 20 months. The increase with age in the number of significant correlations is perhaps indicative of the functional relationship, argued in this study, between home environment variables and the child's cognitive performance.

Language and SES

One of the major factors differentiating the levels

of SES is language. The work of Bernstein (1961; Lawton, 1968) has indicated that lower SES individuals are predominantly confined to a "restricted" language code, whereas upper SES individuals are able to operate in both this "restricted" code as well as an "elaborated" code. "Restricted" codes are characterized by a very limited range of linguistic forms, and they are narrow in the variety of topics to which they may be easily applied. "Elaborated" codes, on the other hand, allow for a greater degree of flexibility in both the linguistic form that may be used to express an idea, and the type of topic that may be discussed.

John and Goldstein (1967) point out that the major factor in the child's linguistic development is verbal interaction with adults. They argue that, particularly in the learning of categories, abstract labels, verbs and other action words, verbal corrective feedback from a linguistically mature adult is of critical importance. Evidence for the operative effectiveness of such an interaction mechanism is provided by studies (eg. Bandura & Harris, 1966) showing that children's linguistic and syntactic style can be modified through the use of modeling and operant conditioning techniques. SES language differences then, argue John and Goldstein, may be explained by the relative unavailability in the lower SES of adult models capable of providing such verbal

corrective feedback.

In terms of its functional relationship to mediatory development, it is important to realize that the critical features of language may not necessarily be those, such as sentence length, grammatical form, and vocabulary, which are the most readily observable. Baratz (1969), using a sentence repetition task with third and fifth grade children, showed that upper SES whites did as poorly on Negro dialect sentences as did lower SES Negroes on standard English sentences. She concluded that lower SES Negroes were as conversant in their own dialect as were upper SES whites in standard English. Thus, SES cognitive differences are not going to be adequately explained by pointing to differences in linguistic form alone. It seems more likely that the use to which language is put by the different levels of SES is the critical functional variable.

Bernstein (1961; 1965) emphasized this very point in explaining the effects of his hypothesized linguistic codes. Although a restricted code, in contrast to the elaborated, is characterized by simple grammatical form, poor syntactical construction, and a limited and rigid use of adjectives and adverbs, Bernstein argues that such a code does not of itself confine the user to a certain level of cognitive development. Rather, the code has the effect of facilitating the direction which development

takes over other possible directions. Specifically, restricted codes facilitate a sensitivity to only the direct content of a message, whereas elaborated codes, with their emphasis on the modification of meaning via grammatical and syntactical construction, facilitate a sensitivity to structure and abstract interrelationships. It is not so much a case of certain generalizations and abstractions being impossible within particular linguistic codes, but rather that they are easier in some than others. Consequently the user of only one linguistic code is unlikely to be confronted with a certain conceptualization, regardless of whether or not he is potentially capable of that conceptualization.

Alternative Viewpoints

It is important to acknowledge that alternatives exist to the conception of cognitive and intellective development espoused in the present study. Two of the most current will be discussed in this section.

The first of these alternatives is the heredity argument developed by Jensen (1969; 1970). According to this view intelligent behavior is seen as categorizable into two fundamental types, level I and level II. Level I behavior is associative in nature and is manifest primarily in the learning of specific responses to

specific stimulus situations. Level II behavior is cognitive in nature and is manifest primarily in tasks involving abstract manipulation. Although level II development is seen as functionally dependent upon the development of a minimum of level I intelligence, the two fundamental types are seen as genetically independent.

Jensen sees SES differences as being a function of genetically based differences in level II behavior. The finding that SES differences become increasingly noticeable with increasing age is seen as resulting from the functional dependence of level II upon level I; level II must perforce develop later than level I. That SES differences occur at all is seen as the result of assortative mating practices. Since first, success in western industrial society is argued to be highly dependent upon level II development, and second, since the tendency is for people to marry within their social class, Jensen argues that the resulting assortative mating could be expected to lead to a high level II gene pool within the upper SES, and a low level II gene pool within the lower SES.

The thesis of the present study is in basic agreement with the hierarchical nature of intellective-cognitive development described by Jensen. That is, the notion of two fundamental types of behavior, associative and cognitive, hierarchically dependent, parallels closely the

model of behavior described previously.

However, the author disagrees with the genetic basis argued by Jensen. While the heredity argument constitutes a legitimate hypothesis, it is felt that too much confidence has been placed in it. The basic evidence used by Jensen in developing the heredity argument comes from correlational twin studies which have yielded an heritability index of .80. What this figure indicates is that 80% of phenotypic variance may be accounted for genotypically, the remaining 20% being the result of environmental effects. However, one critical point has been neglected by Jensen. As noted by Crow (1969), the heritability index is a statistical reflection of the current genotype-phenotype relation. "It does not directly tell us how much improvement in IQ to expect from a given change in the environment (1969, p. 158)." Further, "... measuring heritability may be less important than getting empirical data on the effects of specific environmental factors (p. 159)."

The second alternative viewpoint to be discussed here relates to an ideological dispute that is current among developmental psychologists. Traditionally, the poor performance of lower SES children on various cognitive and intellective tasks has been interpreted in terms of developmental deficits in the children. However, recent studies of lower SES language (Baratz & Baratz, 1970;

Labov, 1969) have indicated that contrary to earlier beliefs, the lower SES individual does make use of a complex and organized language system that is different from, but not necessarily inferior to, the standard English of the culturally dominant upper SES.

These language findings have given rise to the ideological position that cultural deprivation effects might not be the result of cognitive-intellective deficits but differences (Cole & Bruner, 1971; Tulkin, 1972). The familial interaction practices of the lower SES might give rise to qualitatively different styles of thinking and learning that are not coincident with those developed in the upper SES. Consequently, since schools are predominantly upper SES institutions, lower SES children will be at a considerable educational disadvantage simply because they lack facility in upper SES learning styles.

As a general point it can be noted that the cultural difference approach would be expected to lead to socially more relevant research than that previously undertaken. Such an approach places the onus squarely on the educational and research establishment to take account of cultural differences when planning school curricula and programs, and when conducting psychological research. In this respect the difference approach is beneficial.

However, it should be noted that at least in one respect the difference versus deficit dispute is purely

academic. To the extent that success in western society depends upon the acquisition of any one specific skill or learning style, a lack of that skill or style would constitute a deficit, regardless of the possession of different skills or styles. For educators and psychologists to think otherwise would be to deny their responsibility to attempt to provide individuals with the means to move and function freely within society.

With respect to the present study, the difference versus deficit dispute is seen as being largely orthogonal. Although many of the studies reviewed in the following chapter are of a type that has been criticized by advocates of the cultural difference approach, the present study is seen as being quite specific and narrow in its concerns. As will be elaborated later, the basic aim of this study was to establish a functional link between specific facets of language use by the mother in dealing with her child, and the development in the child of mediatory processes.

Summary

The purpose of this chapter has been to introduce the general framework of constructs and functional relationships within which the position of this study is argued. In the following chapter empirical evidence will

be presented to support the argument that the differences in cognitive performance typically found between children of different SES are the result of differences in the child-rearing practices of their parents. It will be argued that the mechanisms involved are those of learning theory, and that language function is a major critical variable.

As a postscript, it is perhaps profitable to note at this point that parent-child interactions are two-way social interchanges. As Bell (1971) points out, the parent's behavior is just as controlled by the child as is the child's behavior by the parent. It can be argued that this bi-dimensional aspect would have an exaggerating effect on SES cognitive development differences. The increasingly sophisticated cognitive behavior of the upper SES child would serve to both reinforce and stimulate previous and further parent-child interactions respectively. Since lower SES parent behaviors are not expected to influence the cognitive development of the child in the same manner as those of the upper SES, the lower SES child would be unlikely to exhibit such cognitive sophistication and would thus not similarly tend to facilitate continuing parent-child interaction. That is, the whole process is cyclic in that parents will tend to perpetuate in their children the various types and levels of behavior that they themselves exhibit.

CHAPTER TWO

Review of Relevant Research Literature

SES Performance Differences on Standardized Cognitive Tests

The practice of comparing the performances of individuals from different levels of SES on cognitive and intellective tests has been a very popular form of study. In one of the earlier examples, Bernstein (1960) found that working-class adolescents performed significantly lower on a Mill-Hill Vocabulary Test than on the Raven's Progressive Matrices, whereas middle-class adolescents produced comparable scores on both tests. Bernstein interpreted these findings as indicative of a relative linguistic deficit in working-class subjects, and as supportive of the existence of different linguistic codes (noted previously) within the different levels of SES.

Other studies have also highlighted this language difference. Karp, Silberman, and Winters (1969) found with 11- to 13-year-olds that significant SES differences in favor of upper SES subjects occurred for each of three verbal comprehension tests, but for only one (WISC Block Design) of five perceptual differentiation tests (eg. Embedded Figures, and WISC Picture Completion). Also,

Teasdale and Katz (1968), using the Illinois Test of Psycholinguistic Abilities (ITPA), found that upper SES six-year-olds performed significantly better than their lower SES peers on all five auditory-vocal subtests but on only one of the four visual-motor subtests.

However, such a lack of SES differences on nonverbal tests has not always been the case. Burnes (1970), using the WISC, found that upper SES eight-year-olds performed significantly better than lower SES peers on both the verbal and performance scales. In a study using the Otis Quick-Scoring Mental Abilities Test, Chase (1970) found that score-matched nine- to 11-year-olds from different SES levels did not attain their scores from different items. The findings of these two studies would seem to indicate that SES performance differences are more likely the result of differences in broadly influential abilities rather than differences in specific ability categories.

Further support for the above point of view is found in a study reported by Fifer (1966). When a test battery representative of verbal, reasoning, numerical, and spatial abilities was administered to Jewish, Negro, Puerto Rican, and Chinese six- to seven-year-olds, it was found that while score profiles differed between ethnic groups, within each group the upper and lower SES profiles were parallel, the upper SES being superior in each test category.

Evidence for such a general cognitive-intellective ability explanation of SES performance differences is also provided by a recent study (Mumbauer & Miller, 1970) using five-year-olds. The writers found that upper SES subjects performed significantly better than lower SES on a paired associate learning task, a familiar figures matching task, the Stanford-Binet intelligence test (SB), and the Children's Embedded Figures Test. Since each of these tasks involved different cognitive abilities, it would appear that the SES differences exhibited were not restricted to specific ability categories. Also, on the matching task and the Embedded Figures Test upper SES subjects had significantly longer response latencies than their lower SES counterparts; perhaps indicative of the former's greater use of mediatory processes.

The importance of language in accounting for SES cognitive performance differences has been further indicated by the results of two recent factor analytic studies. Sitkei and Meyers (1969), using data from a test battery administered to 100 four-year-olds, found that a verbal comprehension factor was the only one of the six found that yielded significant SES factor score differences, the upper SES being superior. In a study with five-year-olds, Ryckman (1967) similarly found a general language ability factor to be the most predominant, accounting for 34% of the variance compared to

approximately five percent for each of the other four factors found. Since both these language factors seemed to be defined in terms of labeling and categorization tasks, it would appear that they were reflecting SES differences in language function rather than purely structure or vocabulary.

In summary then, as well as merely establishing the presence of SES performance differences, the findings of the studies reviewed also signal the possibility that these differences may result from a fundamental difference in sophistication in general cognitive processing skills. Upper SES children, compared to their lower SES counterparts, may have developed to a higher level in the use of such mediatory skills in problem solving situations. The consistent finding of SES language differences, and the possibility that these may be reflecting differences in language use rather than merely form per se, indicates the further possibility of a functional relationship between these language differences and the suggested cognitive skill differences.

SES Developmental Comparisons on Standardized Cognitive Tests

If the SES child-rearing differences are indeed operative in the manner hypothesized then it should be

possible to show their effects developmentally. Because of their increased exposure to the different rearing practices, older children would be expected to exhibit SES differences in cognitive-intellective performance to a greater extent than younger children. Such expectations have been verified.

Golden, Birns, Bridger, and Moss (1971) while finding upper SES children to be superior to lower SES on the SB at age 36 months, found no significant differences for these same children on the Cattell Infant scale at ages 18 and 24 months. Also, it was found that the correlations between child IQ and the mother IQ on the Peabody Picture Vocabulary Test (PPVT) increased in both magnitude and statistical significance with increase in child age.

In a similar longitudinal study, Willerman, Broman, and Fiedler (1970) found no significant SES differences for eight-month-olds on the Bayley Scales of Mental and Motor Development, whereas on the SB at age four years the lower SES subjects from the upper quartile on the Bayley were found to score below even the lower quartile upper SES subjects. In a group study, Palmer (1970) found that at age three to four years upper SES subjects performed significantly better than lower SES on both a perceptual discrimination task and the PPVT, whereas such differences did not occur for younger two-year-old subjects.

Kagan (1970a; 1970b) studied the fixation durations

of infants' attentional responses to stimuli of varying discrepancy from a model. Below the age of 12 months there was a negative relation between fixation time and age, but there were no SES differences. Kagan interpreted this finding as evidence for the development in the child of increasingly adequate basic recognition schema. However, after 12 months, fixation time showed an increasing relationship to age, and further, this relationship was evident moreso for upper than lower SES children. This second finding was interpreted by Kagan as indicative of first, the development of interpretive processes involving repertoires of hypotheses, and second, of the effects of mother-child interaction differences inherent in SES.

As the cognitive-intellective gap between upper and lower SES children widens, it would be expected that these differences would have an increasing interactive effect upon further development. The lower level of mediatory sophistication of the lower SES child, and his predominant use of restricted linguistic codes, would put him at a comparative disadvantage in the school situation. This is the cumulative deficit phenomenon referred to by Deutsch. Its formulation was based on a wide ranging study (Deutsch, 1965) in which correlations between SES and various cognitive factors, predominantly linguistic, were typically found to increase from grade one to grade five.

In summary, evidence supporting the expected

developmental increase in SES differences has been found. It would seem that SES differences in child-rearing practices are apparently acute enough for performance differences in children to become observable as early as perhaps 24 months of age. Furthermore, it would seem that the extent of these performance differences is such that the lower SES child may often be effectively barred from benefiting from normal schooling experiences.

SES Differences on Cognitive Tasks

To date all the studies reviewed have been concerned with SES performance differences on standardized instruments. However, if differences found are indicative of more fundamental cognitive-intellective differences, then they should also occur when children of different levels of SES are compared on other tasks of a cognitive nature.

In two similar studies, Odom (1967), and Gruen and Zigler (1968) each found, on a three choice probability learning task, that upper SES subjects in the six to ten year age range used significantly more scanning patterns of response than did their lower SES counterparts. The lower SES subjects tended to respond in a maximizing fashion, exhibiting no discernible pattern. Gruen and Ottinger (1969) conducted a similar study with grade two

subjects which yielded the same results, but which also indicated that upper SES subjects tended to be more "skill oriented" on a locus-of-control test, whereas the lower SES tended to be "chance oriented". Overall then, the greater use of response patterning by upper SES subjects is perhaps indicative of their greater sophistication, compared to the lower SES, in mediatory skills.

Wei, Lavatelli, and Jones (1971) administered four Piagetian classification tasks to a sample of kindergarten and grade two children. Seven of eight age-task comparisons made yielded significant SES differences in favor of upper SES subjects. Also, the upper SES subjects were found to give logical reasons for their classifications on significantly more items than were the lower SES subjects.

In a concept attainment task involving geometric shapes of different colors, sizes, and numbers, Scholnick and Osler (1969) found that upper SES eight-year-olds made significantly fewer errors before reaching a criterion than did lower SES subjects. Also, it was found that, within each level of SES, subjects given preliminary experience similar to the experimental task performed significantly better than no-training control subjects. Since this preliminary task stressed the same problem solving processes relevant also to the experimental task, these writers concluded that the SES differences found

appeared to be the result of slower information processing on the part of the lower SES subjects.

Evidence of SES differences in mediatory processing sophistication also comes from some of the studies concerned with the effects of different reinforcers. The frequent finding in such studies (eg. Terrell, 1958; Terrell & Kennedy, 1957; Zigler & deLabry, 1962) is that when response adequacy feedback is given via either a tangible reinforcer such as a candy, or a neutral signal such as a light flash, then upper SES children perform equally well under either reinforcement condition whereas lower SES children perform better under the tangible condition. Such findings can be interpreted as indicating that, in contrast to lower SES subjects, upper SES children attend primarily to the informational content inherent in reinforcers, and thus for them the actual physical identities of same are functionally irrelevant.

A similar interpretation can also be made of the findings of other studies of this form (eg. Terrell, Durkin & Wiesley, 1959) which have shown that upper SES children perform poorer under the tangible than signal reinforcement conditions. If indeed upper SES subjects do make relatively greater use of mediatory processing, then they would be expected to be more susceptible to the possible distracting effects of tangible reinforcers than would their lower SES counterparts. The finding by Spence

(1970) that upper SES second and third graders were far more distracted by a light flash reinforcer defined in terms of candy-later equivalence than were their lower SES age-mates tends to support such a contention.

The recent finding (Eley, 1971) that upper SES second grade subjects did equally well under reinforcement conditions which were either preceded or not preceded by instructions delineating the response correctness relevance of the reinforcer, whereas lower SES subjects did poorly under the no-instructions condition, also lends support to the contention that upper SES children attend primarily to the informational content of reinforcers. The fact that the provision of preliminary instructions made no difference to the upper SES subjects indicates that they were perhaps already using the reinforcers as information sources.

In summary then, from the preceding studies it would appear that, compared to the lower SES, upper SES children typically exhibit a greater degree of response patterning, perform more efficiently and logically on classificatory tasks, and seem to attend to reinforcers as sources of response adequacy information. All this lends support to the hypothesis that upper SES children possess a greater degree of sophistication than do lower SES children in problem solving and information processing skills.

SES Differences in Children's Language and Communication

The major theme of this study is that the cognitive performance differences found between children of different levels of SES result from differences in their respective levels of sophistication in mediatory skills. It is argued that these skill differences are in turn a function of SES child-rearing differences, with language use being a critical variable. If such is the case, then it should be possible to observe differences in the language and communication skills of these children.

Two recent studies have evidenced the possibility of differing emphases, between upper and lower SES, in the use of language. Wallach and Martin (1970), rating elementary school children for expansiveness on an unrestricted drawing task, found the drawings of lower SES children to be significantly more expansive than those of the upper SES. These writers argued that this finding was perhaps indicative of a greater relative emphasis in the lower SES family on motoric rather than verbal expression, with the opposite being true for the upper SES family.

In the second study (Jeruchimowicz, Costello & Bagur, 1971) lower SES four- to five-year-olds were found to exhibit a significantly higher proportion of verb than noun errors on the PPVT, whereas upper SES subjects showed

no such differences. The writers argued that since the learning of action labels requires more adult-child corrective verbal interaction than that for object labels, a point also noted by John and Goldstein (1967), then these findings may evidence a lack of such interaction in the lower SES child-rearing environment.

Wiener and his colleagues (Brooks, Brandt & Wiener, 1969; Kashinsky & Wiener, 1969) have investigated the differential effects across SES of voice inflexion in verbal feedback. The findings, with five- to six-year-olds, were that on both performance and latency scores, lower SES subjects did better under a positive inflexion condition than under either neutral or negative inflexion conditions, whereas upper SES subjects performed equally well under all three. It would appear that the lower SES subjects were attending to the inflexional content (an irrelevant information source) of the feedback as a sort of "marker", whereas the upper SES subjects were attending only to the verbal content. Of the two groups then, the upper SES were the more efficient in the use of the relevant information.

Recent findings have indicated a likely relationship between SES differences in children's language use and their concomitant differences in cognitive processing sophistication. Baldwin, McFarlane, and Garvey (1971) administered a communication accuracy task to a sample of

same-SES, same-sex, same-race, grade five dyads. The task required one subject to verbally describe a simple picture to a visually screened partner who then had to select an identical picture from an array of pictures differing from one another on one, two, or three critical attributes. Although there were no SES differences on either total verbal output or total number of dyad exchanges, the upper SES subjects nevertheless communicated significantly more critical attributes than did the lower SES. Such a difference in the efficiency of communicating critical information is perhaps reflective of parallel differences in the efficiency of discerning and processing same.

Further to this point, Gever and Weisberg (1970) administered a concept sorting task to subjects from pre-school, grade one, and grade three age groups. While the upper SES subjects did perform significantly better than the lower SES, of more immediate interest was the finding that the upper SES subjects also exhibited significantly more spontaneous verbalization. If such verbalization can be taken as evidence of mediatory activity, which would appear to be legitimate since it was also found that a greater degree of spontaneous verbalization was exhibited during the more difficult sections of the task, then the findings from this study seem to support the position that, first, the upper SES subjects were more adept than the lower SES in the mediatory processing skills involved,

and second, that these skills involved a degree of verbal-symbolic mediation.

In summary, the above studies evidence a likely link between cognitive and language skills. Some indication has been given of likely differences between the levels of SES in their relative emphases on verbal communication and parent-child verbal interaction. Also, it would seem that upper SES children are more efficient than lower SES at both the giving and receiving of verbally communicated information, perhaps reflective of such differing emphases. And, finally, it would seem that the cognitive processing skills sampled are to some degree facilitated by such verbal skills.

Cognitive Development and Home Environment

So far in this chapter the concern has been primarily with the delineation of the cognitive performance differences that exist between children of different levels of SES. To date, while some tentative inferences have indeed been made, no direct empirical evidence has been presented to support the hypothesized link between cognitive development and child-rearing practices. The purpose of the remaining sections of this chapter is to provide such evidence.

A number of studies outside the area of SES have

attempted to relate the child's performances on standardized cognitive-intellective tests to home environment variables gleaned from parent interviews and questionnaires. In a study typical of these Henderson and Merritt (1968) found that the home environments of six-year-olds scoring highly on the Goodenough-Harris Drawing Test and the Van Alstyne Picture Vocabulary Test were rated significantly higher than those of their low scoring peers on each of achievement pressure, availability of adult language models, academic guidance from the family, education of the mother, number of periodicals in the home, occupational status of the father, parental estimation of the child's ability, and smallness of the family.

Corroborative findings have been observed in other similar studies. Bing (1963) showed that high performance by grade five children on standardized verbal ability tests was significantly related to the occurrence of verbal stimulation early in the child's life, as well as to the number of storybooks in the home, and the participation by the child in mealtime conversations. Garber and Ware (1970) found that the performance of grade one children on the PPVT related positively to parental expectations of school success, and the availability of learning materials in the home. Kent and Davis (1957) found that the SB performance of eight-year-olds related

positively to the use of child-rearing practices in which parental affection, acceptance, and approval were made conditional upon satisfactory performance by the child.

Jones (1972), using 10- to 12-year old boys matched on Raven's Progressive Matrices, found the home environments of subjects rating highly on WISC verbal ability scales to be significantly superior to those of low verbal ability subjects with respect to 1) an index of the parental disposition to encourage the child to interact with the home environment on a verbal-cognitive level, 2) the academic and vocational aspirations held by the parent for the child, and 3) the frequency of such things as mealtime conversations, family reading habits, and library use, each constituting opportunities for the development and use of language. Further, Jones also found that the high verbal subjects ranked significantly higher than the low verbal with respect to SES.

Radin (1972) compared the interactions of upper and lower SES fathers with their four-year-old sons during an at-home interview. While the upper SES children were found to be significantly superior to the lower SES on both the SB and the PPVT, it was also found that the upper SES fathers were significantly greater than the lower SES on each of 1) the total number of father-child interactions observed, 2) the frequency of nurturant behaviors, 3) the frequency of meeting the child's needs, and 4) the

frequency of asking information of the child.

In a longitudinal study, Honzik (1967) administered various IQ tests to a sample of children at frequent intervals from ages 21 months through to 30 years. Since the various parental and familial characteristics used were derived from data collected at child age 21 months, not too much importance can be attached to the findings for later adult ages. For the earlier childhood ages, however, the results of this study remain pertinent. Child IQ was found to correlate positively and significantly with family SES from ages three- to five-years on, with adequacy of home play facilities from ages three- to ten-years on, and with mother's attentiveness from ages three- to nine-years on.

In a study using seven-year-olds, Bresnahan and Blum (1971) reported finding tentative evidence for the effects of a relatively pervasive home environment variable. A visual discrimination problem solving task was preceded by zero, six, or 12 trials in which both cues in the relevant stimulus dimension were reinforced equally but randomly. While overall the performances of lower SES subjects were found to be significantly poorer than those of the upper SES, the significant SES x preceding trials interaction was of relatively greater theoretical interest. For the upper SES subjects, performances under the two random reinforcement conditions were significantly poorer than

those under the remaining condition. No such differences occurred for the lower SES subjects.

Bresnahan and Blum inferred from these findings that the poor performances of lower SES children on such discrimination tasks may have been functionally related to the habitually chaotic reinforcement patterns of their home environments. Without further evidence however, such a conclusion is tantamount to inferential gymnastics. The findings may be much more parsimoniously interpreted in terms of SES mediational differences. Subjects not facile in the use of mediational processes would not be expected to be affected by the preceding random reinforcement conditions since these conditions should not have altered the response probabilities of the stimulus cues. However, such preceding conditions would have provided interfering erroneous feedback to mediating subjects; in all likelihood causing them to prematurely reject what may have been a correct response hypothesis. Thus the results of this study are supportive of the hypothesized superiority of upper SES children in the use of mediatory processes.

Notwithstanding the above argument, however, the Bresnahan and Blum (1971) study raises quite an important point. If the trend in cognitive development is seen as being towards the extraction of invariants from the environment, and the development of cognitive processes

enabling the individual to deal with these invariants, then it would seem that such would be facilitated by a minimum of non-orderly variation in that environment. Consequently, in the relatively chaotic social milieu observed to exist in the lower SES family (eg. Lawton, 1968), with its lack of regular and uniform reinforcement and disciplinary patterns, the child could perhaps not really be expected to develop adequate cognitive response patterns to any high degree of sophistication.

Tizard, Cooperman, Joseph, and Tizard (1972) related, among other things, the verbal environments of 24- to 59-month-old children living in foundling home nurseries to the verbal development of these children. Significant positive correlations were found between scores on the Reynell Comprehension Scale and each of 1) the number of instances of staff engaging in informative rather than merely directive conversation with the children, 2) the frequency of staff answering the children's remarks, 3) the frequency of staff playing with the children in such fashion that the child had an active rather than passive role, and 4) the overall number of instances of staff-child social activity. Because their respective correlations were found to be high, the frequency of informative adult-child conversation and the frequency of adult answering of children's remarks were both argued by the writers as being critical factors in language

development.

In summary, from the findings of the preceding studies, it would appear that the cognitive development of the child is facilitated by such things as the availability of a variety of materials in the home, a high level of adult-child verbal interaction of an informative nature, and the provision of a uniform family environment in which the child's interactions with it lead to regular and orderly consequences. While the majority of these studies were not specifically concerned with SES, it can nevertheless be noted that many of the familial variables found by them to relate to cognitive development have also been found to relate to SES.

The Mother-Child Dyad

In the previous section it was found that a number of family and parent-child interaction variables related to the cognitive development of the child. In the groups of studies to be reviewed in this section it will be seen that these same variables also parallel the SES variable. That is, those variables found to facilitate cognitive development tend to cluster together rather than occurring independently, and they tend to occur predominantly within the upper levels of SES.

All the studies in this section deal with direct

observation of parent-child interactions in various informal and structured situations. In the second phase of a study referenced earlier, Bing (1963) found that mothers of children previously ranked high in verbal IQ gave more help to their children during various verbal and nonverbal tasks than did the mothers of low verbal IQ children. Also, the high verbal IQ mothers gave more help upon request from their children, and their children exhibited more bids for help, than was observed for the low verbal IQ dyads; a finding which emphasizes the dual controlling nature of parent-child interactions noted in chapter one (Bell, 1971).

In a similar study, Busse (1969) found that 11-year-olds scoring high on a flexible thinking task had parents who gave a medium amount of assistance in a parent-child interaction session, indicating that for at least some facets of cognitive development either too much or too little parental intervention may be equally detrimental. Perhaps a minimum optimal level of parental intervention is necessary to help the child identify the critical features of a task, but too much may inhibit his experiencing the consequences of his primitive mediatory response patterns, thus denying their operant evolution to more effective and efficient forms.

Dyad observation designs have also been applied to the SES variable. Tulkin and Kagan (1970) observed mothers

with their 10-month-old infants in their own homes. The lower SES children were observed to spend significantly more time than the upper SES both confined to playpens and highchairs, and in front of television. While there were no SES differences in the frequency of kissing and cuddling, the upper SES mother placed her infant in a face-to-face position significantly more often than did the lower SES mother; a noteworthy difference considering the presumably critical role of the distance receptors in the child's cognitive development (Walters & Parke, 1965). Upper SES mothers showed significantly greater frequency than lower SES in a variety of verbal interaction behaviors such as initiating vocalizations, and responding to the child's vocalizations; a conspicuous parallel to the language differences exhibited by children of different SES. Similar findings to these have also resulted from a study with four- to five-year-olds (Kogan & Wimberger, 1969).

Schmidt and Hore (1970; Hore, 1970) have studied the nonverbal communicative behavior of mother-child dyads with five-year-old children. As well as finding that upper SES mothers used complex language forms significantly more frequently than lower SES mothers, these writers also found that upper SES mothers were significantly greater than the lower SES in both time and instances spent looking at their children; corroborating the finding noted

above.

A number of dyad studies have been specifically concerned with the variations in the teaching behavior exhibited by mothers of different SES. Using dyads with three- to five-year-old children in unstructured play sessions, Walters, Connor, and Zunich (1964) found that upper SES mothers were significantly more frequent than lower SES in instances of interactive playing, the latter tending to adopt silent onlooker postures. Also, in their tendency to direct and structure the play activity, the upper SES mothers exhibited a greater frequency of helping than did the lower SES.

With dyads having the same age characteristics as those above, Hess and Shipman (1965) observed the verbal interaction of mothers teaching their children a simple card sorting task. Upper SES mothers were found to be significantly more frequent than the lower SES in the use of abstract word forms, and complex syntactical structures. On the task itself, upper SES mothers tended to use categorical sorting strategies whereas the lower SES mothers used relational or contextual strategies. In a similar study, Bee, van Egeren, Streissguth, Nyman, and Leckie (1969) found that upper SES mothers were significantly more frequent than lower SES in the making of suggestions to their children in question form, and in the provision of positive feedback. Also, the upper SES

mothers were less specific than the lower SES in their suggestions.

In a very significant study, Brophy (1970) highlighted the SES differences in the functionality of language. In teaching their four-year-old children a block sorting task, the upper SES mothers both provided labels for the critical sorting attributes and focused their children's attention on those attributes significantly more frequently than did the lower SES mothers. Also, the upper SES mothers spent significantly more time than the lower SES in preliminary explanation and emphasis of these critical attributes to their children.

In summary, the first point that may be noted is that the kinds of family environmental variables, such as parent-child verbal interaction and the provision of positive feedback, previously found to relate to specific facets of cognitive development, do tend to be exhibited in conjunction with one another, and more importantly they do tend to define the SES differences in child-rearing practices. It would seem reasonable to conclude then that in general the parent-child interaction practices of the upper SES parent tend to be more facilitative of the child's cognitive development than those of the lower SES parent.

Second, there seems to be a definite parallel between the interaction and rearing practices of the parent, and

the cognitive symbolic skills exhibited by the child; indicating the possibility of a functional link between them. The greater glancing and eye-to-eye contact observed for upper SES mother-child dyads may have mediated a monitoring by the mother of her child's activities, as well as possibly acting as a reinforcer for the child. The greater freedom of exploratory movement allowed the upper SES child would be expected to increase the potential scope of its interactions with the environment. The use of abstract and complex language by the upper SES parent would both provide the child with an adequate language model, and confront it with a wide range of informational stimulation. The more frequent adult-child verbal interaction observed for the upper SES would provide the child with the corrective feedback noted previously as being necessary for its adequate linguistic and cognitive development.

Finally, even though SES vocabulary and syntax differences were observed, the finding that for the upper SES language was used much more often and more effectively as a means of communicating critical information than was so for the lower SES has important implications for the child's cognitive development. The labeling and attention focusing of the upper SES mother could be expected to expedite the child's development of mediatory processes by maximizing the likelihood that such processes would evolve

around the critical features or aspects of the task concerned. Also, the practice of the upper SES mother of directing the behavior of her child via suggestive questioning would perhaps constitute a model for the child in the development of its own mediatory response monitoring practices. Regardless of whether the lower SES mother is capable of using language in the same manner as the upper SES, she tends not to do so and thus the cognitive development of the lower SES child would not be expected to be similarly facilitated.

Intervention Studies

Further evidence of the developmental functionality of the various child-rearing variables discussed in this review is found in studies that have attempted to counter lower SES developmental deficits. Such intervention studies have usually been of two forms.

In the first, the intervention involves the provision of extra stimulation to deprived preschool children via local special kindergartens (Gray & Klaus, 1965; McConnell, Horton & Smith, 1969). During this special tuition attention is given to such variables as general language facility, classificatory skills, sensory-perceptual skills, and exposure to such things as books, story telling, and story games. Findings have typically

shown that at the end of the one or two year programs experimental subjects have shown significantly greater increases than no-training controls on such instruments as the SB, PPVT, and the ITPA, as well as various other tests of language and cognitive development.

However, the results of the little follow-up work that has been done (Gray & Klaus, 1970; Jacobson & Greeson, 1972) indicate that experimental subjects gradually lose at least part of this developmental lead once the intervention ceases. Even though the original effects of intervention have really been nothing short of remarkable considering that the total time spent by these children in the kindergarten training programs was often less than two percent of their total waking hours from birth to six years of age, it would seem that unless some permanent accompanying changes occur in the child's home environment such cognitive gains are unlikely to be maintained.

In light of such follow-up findings it may be that in the long run the second type of intervention study (Levenstein, 1970; Karnes, Teska, Hodgins & Badger, 1970) will prove to be the more fruitful. The major emphasis in this type is upon the interaction processes of the mother. Using various techniques such as modeling and regular meetings, lower SES mothers are taught such teaching strategies as positive reinforcement, stepwise mastery,

information giving, and questioning. Various stimulus materials are provided to the mothers and they are instructed as to their use with their children in such tasks as category sorting, letter discrimination, object sequencing, seriational and dimensional vocabulary, and object-picture matching. In experimental versus control comparisons the results have been of the same form as those of the first group of intervention studies. The important thing, however, will be whether or not the cognitive developmental gains resulting from these programs will prove to be permanent. No follow-up information is currently available, but since the central emphasis has been toward modifying the home environment, permanency would hopefully be expected.

Summary

In this review, evidence has been presented from a number of research streams in an attempt to delineate both the types and causes of SES differences in cognitive development.

In the early sections studies were presented comparing children from different levels of SES on their performances on various cognitive and intellective tests. The range of abilities and skills in which the upper SES performed better than the lower SES varied, but one factor

that seemed to appear with consistency was that of language.

In comparison studies involving an age variable it was found that, apparently as a result of its cognitive development deficit, the lower SES child became increasingly incapable of benefiting from future stimulation such as is provided in the school. The lower SES child seems to be caught in a vicious cycle of cumulative effects.

Further evidence of SES differences in cognitive development was presented via studies involving various problem solving and information processing tasks. Upper SES children exhibited a higher degree of sophistication in categorization skills, showed a greater frequency of patterned responses, and used correctness feedback with greater efficiency than did their lower SES counterparts.

The SES language differences were again noted with studies comparing children on their language and communication skills. Upper SES children exhibited a greater knowledge of action words than did lower SES children; indicative perhaps of the former's more extensive adult-child verbal interaction opportunities. Upper SES children were found to be more efficient than their lower SES peers in both interpreting and communicating verbally encoded information. Possibly as evidence of their greater use of mediatory processes,

upper SES children exhibited more spontaneous verbalizations during concept sorting behaviors than did lower SES children.

In the later sections of this review, studies were noted that related these cognitive performance differences to parallel differences found in the home environments and various child-rearing practices of the upper and lower levels of SES. Superior performances by children on various cognitive and intellective tests have been shown to relate to such things as the education of the parents, the availability of adult language models, the occurrence of adult-child verbal interaction of a nurturant and informative nature, the availability of periodicals and other materials in the home, parental support and encouragement of the child's cognitive performances, the frequency of child participation in mealtime conversations, and the attentiveness of the mother. Evidence was presented in support of the contention that lower SES parent-child interactions and discipline techniques are typically random and irregular compared to those of the upper SES family; a point of some importance when considering the overall evolution of efficient cognitive response patterns.

Dyad observation studies further corroborated the above findings. Upper SES mothers were more vocal in their interactions with their children than were lower SES

mothers. Also, upper SES mothers seemed to be more implicitly aware than their lower SES counterparts of the mediatory importance of the sensory distance receptors. Of significant note was the finding that in their teaching behavior upper SES mothers made a greater functional use of language in the provison of labels, the focusing of attention, and the general directing and structuring of the child's task performance than did lower SES mothers. Furthermore, upper SES mothers more frequently provided positive reinforcement and corrective feedback to their children than did lower SES mothers.

Finally, intervention studies gave further testimony to the importance of the above mother-child interaction behaviors. When lower SES preschoolers were given supplementary experience in various cognitive skills, or when lower SES mothers were tutored in interactive techniques facilitative of such skills, these children showed significant gains in their cognitive development.

In conclusion then, from the preceding review it would seem that there is a definite functional link between, on the one hand, parent-child interaction and child-rearing practices, and the continuing cognitive development of the child on the other. The cognitive performance differences between children of different levels of SES on various cognitive tasks would appear to be the result of parallel differences in child-rearing

practices. Although it is obviously not the only variable involved, the SES differences in the use of language as an information transmission vehicle would seem to be of critical importance.

What appears to be needed in terms of future research is a series of studies aimed at directly relating specific SES child-rearing differences to the performance by the child on various individual cognitive tasks. To date, studies investigating SES differences in child-rearing and child cognitive performance have used separate samples. Consequently, no matter how consistent and impressive the findings have been, the link between these two factors remains largely one of inference. In future studies children could be selected as subjects on the basis of observations of their mothers' specific interactive practices, and then their performance compared on various cognitive tasks. The specific functional relationships inferred from such studies should thus be of greater strength.

CHAPTER THREE

Hypotheses

General Rationale

The studies reviewed concerning the relationship of SES to the child's development of mediatory processes can be divided into two broad categories. In the first category the studies seem to have been primarily concerned with delineating the environmental differences; social, physical, and intellectual; between the various levels of SES. In the second category the studies have been primarily concerned with comparisons between children of differing SES on various cognitive and intellective tasks. Broadly speaking, the performances of the children in the second category studies have been paralleled by the environmental differences found for the first category studies.

However, it seems surprising to note that in an area that has been relatively heavily researched, it would appear that no studies have been concerned with trying to isolate relationships between specific facets of child-rearing and specific types of cognitive processes in the child. This present study represented an attempt to do just that.

Within SES levels, children could be selected on the basis of their placement with respect to some specific environmental variable. These children could then be compared for their performance on some specific type of cognitive processing task. The strength of the relationship between the environmental variable and the child's cognitive processing could then be assessed in terms of the strength of any comparison differences that might occur. In such fashion each individual familial and environmental variable inherent in SES might conceivably be assessed for its relative importance in the development of specific cognitive processes in the child.

Because of its recurrent observation in the studies reviewed, and its seemingly functional role in mediatory development, the SES differences in language use seemed to be a good place to start such research. In this study the children were selected on the basis of their mothers' language use during a mother-child dyad observation session. The children were then compared on various facets of their performances on two visual discrimination shift tasks. The use of shift tasks allowed inferences concerning the mediatory processes of the children, and thus any comparison differences that occurred on these shift tasks could be used in inferring a relationshiip between the development of such processes and the language uses of the mother.

Definitions: I

Sorting Task : a group of wooden blocks differing independently in terms of size (small versus large) and color (black versus yellow) were sorted into four distinct size-color categories.

Sorting Attributes : the attributes of the blocks upon which sorting was based, that is size and color.

Attribute Labels : labels for the respective sorting attributes, that is "size" and "color" or suitable synonyms.

Sorting Response : the act of placing a block into its relevant sorting category.

Preliminary Explanation or Orientation Period : when teaching their children the sorting task, the mothers typically began with an initial time interval of general explanation and/or demonstration.

Informational Feedback : the practice of the mother of informing her child of the adequacy of its responses, in terms of response correctness, and in terms of providing information relevant to defining what a correct response should be.

Global Rule Statements : statements, made by the mother while teaching the sorting task, which defined for the child just what the correct categorization procedure involved; for instance "Look at the size and put the big

blocks here and the small ones there."

Post-response Feedback : response correctness information given to the child by the mother immediately following a sorting response.

Relevant Attribute : the sorting attribute upon which the sorting was currently based.

Focusing or Directing Attention : the practice by the mother of prompting the child, either verbally or via manual pointing, to attend to a specific attribute or stimulus value within that attribute, or to attend to a demonstration being performed by the mother.

General Hypothesis 1

In mother-child interaction sessions, upper SES mothers will exhibit more instances of monitoring and guiding their children's activity, and will more frequently provide their children with informational feedback, than will their lower SES counterparts.

Rationale. From the preceding review of the relevant research literature it has been found that, compared to the lower SES, the parent-child interaction practices of the upper levels of SES appear to be more facilitative of the development of mediatory processes in the child. Upper SES mothers have been observed to monitor their children's

activities more closely and to provide their children with greater informational feedback than have lower SES mothers. Consequently, if mothers of both upper and lower SES were to be placed in the situation of having to teach their young children a block sorting task, then the following hypotheses would be expected to be upheld.

Specific Hypotheses

H11: The mean total lapsed time spent in the preliminary explanation period will be significantly greater for upper than lower SES mothers.

H12: Significantly more upper SES than lower SES mothers will provide verbal attribute labels for their children during the preliminary explanation period.

H13: Significantly more upper than lower SES mothers will focus or direct their children's attention towards the sorting attributes during the preliminary explanation period.

H14: In instructing their children to make a specific sorting response, the mean proportional frequency of the mother's verbalizing the relevant attribute labels will be significantly greater for upper than lower SES mothers.

H15: In instructing their children to make a specific sorting response, the mean proportional frequency of the mother's directing her child's attention towards

the relevant sorting attribute will be significantly greater for upper than lower SES mothers.

H16: The mean proportion of global rule statements, given prior to a specific sorting response by the child, and containing verbalizations of the attribute labels, will be significantly greater for upper than lower SES mothers.

H17: The mean proportion of post-response feedback instances containing a verbalization of the relevant sorting attribute labels will be significantly higher for upper than lower SES mothers, regardless of whether the immediately preceding sorting response by the child was correct or not.

H18: The mean proportion of post-response feedback instances during which the mother directs her child's attention towards the relevant sorting attribute will be significantly higher for upper than lower SES mothers, regardless of whether the immediately preceding sorting response by the child was correct or not.

Definitions: II

Visual Discrimination Task : the subject was administered a series of simultaneously presented pairs of visual stimuli. Each member of each stimulus pair differed from

its partner in terms of two stimulus cue values within each of two independent stimulus dimensions. The same cue values were used for each stimulus pair, but in different combinations across dimensions. The subject was required to select that member of each pair that he considered to have been designated correct in terms of a specific cue value within one of the stimulus dimensions.

Stimulus Cue Value : a discrete instance of any one stimulus dimension, for instance "red" was a cue value within the "color" dimension.

Stimulus Dimension : a distinct categorical grouping of stimuli, for instance "colors", "shapes", and so on.

Trial : one stimulus pair presentation and subsequent subject selection response.

Criterion : ten consecutive trials in each of which the subject made the correct selection.

Response Latency : time lapse between the presentation of a stimulus pair and the subsequent selection response.

Response Correctness Feedback : immediately following each selection response, the subject received a short auditory signal if his response was correct, or no signal if his response was incorrect.

Learning Curves : graphs showing correct trials per trial-block on the vertical axis, and trial-blocks on the horizontal axis.

Trial-block : a group of five consecutive trials.

Discrimination Shift : following the attainment of criterion the definition of what constituted a correct selection response was altered, unbeknownst to the subject. The subject was then required to re-attain criterion.

Intradimensional Shift : within each of the stimulus dimensions, the specific cue values distinguishing each member of the stimulus pairs were altered following the shift. A correct selection response was defined in terms of a new cue value from the same dimension that was relevant before the shift.

Extradimensional Shift : the same post-shift cue changes as for the intradimensional shift, but a correct response was now defined in terms of a new cue value from the, pre-shift irrelevant dimension.

Training : a short film showing an adult male model solving a visual discrimination task whilst simultaneously verbalizing aloud his cognitive symbolic mediatory solution processes.

General Hypothesis 2

Upper SES children will perform better than their lower SES counterparts on a visual discrimination task.

Rationale. If the maternal tutoring behaviors hypothesized above as differentiating between upper and lower SES mothers are in fact functionally related to the development in their children of mediatory processes, and if such behaviors are in fact typical of the everyday practices in the home environments of upper and lower SES families, then the upper SES children whose mothers exhibited such cognitively facilitative behaviors would be expected to show greater mediatory sophistication than would their lower SES peers. Thus, if young children from upper and lower SES, having mothers who fulfilled the hypotheses above, were administered a visual discrimination task, then the following hypotheses could be made regarding their comparative performances.

Specific Hypotheses

H21: The upper SES children will require a significantly smaller mean number of trials to attain criterion than will the lower SES children.

H22: The mean response latency for the upper SES children will be significantly longer than that for the lower SES children.

H23: The learning curves for the upper SES children will show sharp and abrupt rises to asymptote whereas those for the lower SES children will rise gradually to asymptote.

General Hypothesis 3

Upper SES children will perform better under an intradimensional shift than an extradimensional shift, whereas lower SES children will show no differences in performances between the two shift types.

Rationale. The different levels of sophistication in mediatory processes hypothesized in this study as distinguishing between children of upper and lower SES would be expected to lead to differential performances by these children under a visual discrimination shift task. The work of Kendler (1971) using shift paradigms has indicated that mediatory processes probably begin to develop around five years of age, with the younger child's shift performance being explicable by a single unit learning theory.

Paralleling that which underlies the Kendlers' work (eg. Kendler & Kendler, 1959), the rationale underlying the use here of the total change shift paradigm is as follows. For subjects facile in mediatory processing, the post-shift situation under an intradimensional (ID) shift would require the learning of only a new final link in the overall discriminative stimuli to choice response chain. Under an extradimensional (ED) shift, however, these same

subjects would need to learn an entirely new mediated chain. Consequently such facile subjects should find ID shifts significantly easier than ED shifts.

In contrast, subjects not facile in mediatory processing should find neither shift type easier than the other. For these subjects discrimination learning supposedly involves the learning of direct associations between specific stimulus cues and specific choice responses. Thus, since in the total change paradigm entirely new stimulus cues are used after the shift, such non-mediating subjects would need to learn an entirely new set of equally difficult post-shift stimulus-response associations, regardless of shift type.

Thus, if upper SES child-rearing practices are more facilitative of mediatory processes than are those of the lower SES, then such should be reflected in the different shift performances of upper and lower SES children at this critical five year age level. A child relatively sophisticated in mediatory processing would be expected to perform better under an ID than an ED shift. A child whose mediatory processes were relatively underdeveloped would be expected to perform no differently under either shift type. Consequently, in comparing upper and lower SES children on a total change shift paradigm, the following hypotheses could be made.

Specific Hypotheses

H31: Upper SES children will require a significantly smaller mean number of trials to re-attain criterion following an intradimensional shift than following an extradimensional shift.

H32: Lower SES children will show no differences between intra- and extradimensional shifts in terms of the mean number of trials required to re-attain criterion following the shift.

H33: Upper SES children will re-attain criterion after an intradimensional shift in a significantly smaller mean number of trials than will lower SES children.

General Hypothesis 4

The performances of lower SES children on visual discrimination tasks will show a greater improvement following a training sequence than will those of upper SES children.

Rationale. If the differing levels of sophistication in the use of mediatory processes, hypothesized to exist between children of upper and lower SES, are in fact the result of differing child-rearing practices, then the use of such mediatory processes by children should be susceptible to deliberate training effects. Thus, the

mediatory processes of a child relatively unsophisticated in same should be improved by tutoring in the use of such processes. While such training would also be expected to improve the performance of the child relatively sophisticated in the use of mediatory processes, the improvement would not be expected to be as great. Thus in comparing the effects of training in the use of mediatory processes with children of upper and lower SES, the following hypotheses could be formulated.

Specific Hypotheses

H41: The decrease from pre- to post-training in the mean numbers of trials required to attain criterion on simple visual discrimination tasks will be significantly greater for lower SES children than for upper SES children.

H42: The increase from pre- to post-training in the mean response latencies for visual discrimination tasks will be significantly greater for lower SES children than for upper SES children.

H43: The discrimination learning curves of both upper and lower SES children will show abrupt rises to asymptote following a training sequence.

H44: Following training, both upper and lower SES children will require significantly smaller mean numbers of trials to re-attain criterion after an

intradimensional than after an extradimensional discrimination shift.

CHAPTER FOUR

Method

This study consisted of two distinct phases. The first phase involved the observation of mother-child dyads drawn from different levels of SES. The second involved the administration of a series of experimental tasks to the children. The basic purpose of the study was to attempt to relate the performances of the children in the second phase to the mother-child interactions observed during the first phase.

Phase one was in effect a replication of a procedure used by Brophy (1970). Upper and lower SES mothers were observed in an interaction session with their young children. Each mother was required to teach a simple block sorting task to her child. The use of language by each mother during this session was recorded. On the basis of the mother's language use in this interaction session, children from within each level of SES were selected for the different experimental groups of phase two. Data collection for phase one took from June 22, 1972 until July 31, 1972 to complete.

In phase two the children were administered two visual discrimination shift tasks with an intervening training sequence. Since the aim of this study was partly

to demonstrate a difference in the mediatory sophistication of children from upper and lower levels of SES, the discrimination shift paradigm appeared to be the most appropriate experimental procedure. However, even though much research into the development of mediatory processes has been done using simple reversal and nonreversal shifts under either the basic or optional shift paradigms (Kendler, 1971; Kendler, 1963; Kendler & Kendler, 1970), the real possibility of confounding interpretations for the data from such procedures (Shepp & Turrisi, 1967; Slamecka, 1968) seemed to indicate the need to use an alternative shift paradigm. Consequently, in this study, intradimensional (ID) and extradimensional (ED) shifts within a total change paradigm were used.

The intervening training sequence in phase two was modeled on a procedure used by Rapier (1968). Its purpose was to provide corroborative data to those observed in the two discrimination shift tasks. If a lower mediatory sophistication is observable for lower SES children, and if such can be related to mother-child interactions such as those observed in phase one, then compared to their upper SES counterparts lower SES children could be expected to react differently to any tutoring in the use of mediatory processes.

Data collection for phase two took from September 5, 1972 to October 2, 1972 to complete.

Apparatus

Phase one involved the use of a Sony 3600, new format, one-half-inch video tape recorder; a Sony CVC 2100A television camera; six half-inch 2,400 feet video tapes; a stopwatch; three black three-inch wooden cubes; three yellow three-inch wooden cubes; three black one-and-a-half-inch wooden cubes; and three yellow one-and-a-half-inch wooden cubes.

Phase two was administered via an IBM 1500 computer system using the IBM 1510 Instructional Display, IBM 1512 Image Projector, and IBM 1506 Audio Unit computer assisted instruction (CAI) facilities. Phase two also involved the use of a Canon 814 super 8mm movie camera, a Bell and Howell 466Z 8mm movie projector, a Sony TC110 audio cassette tape recorder, an audio tape cassette, two cassettes of Kodak Ektachrome super 8mm color film, and about 130 assorted 10 cent candy bars.

Subjects

During April 1972, the census roles of the city of Edmonton, Alberta, were searched for intact families which were listed as having the eldest child in the age group that would be beginning school in September 1972, and as having the mother not working fulltime during the day.

These families were then checked against the Henderson's Edmonton, Alberta, City Directory 1972 in order to determine the occupation of the father. Following this, the level of SES for each family was determined by ranking the father's occupation on the Blishen (1968) scale (see Appendix A).

Those families that fell towards the extremes of the SES scale were then contacted by either telephone or mail. For the telephoned families the experimenter identified himself by name and departmental affiliation, and then explained to the parent how his/her name had come to be selected. The study was outlined in layman's terms, with the experimental tasks being referred to as games. SES was not explicitly mentioned but rather it was explained that the intention was to sample a cross-section of the city's population. The parent was assured that there was nothing in the study of an aversive nature, and that the child's physical well-being would in no way be in jeopardy. It was explained to the parent that participation would involve at most two short visits to the campus, and that transportation by taxi, at departmental expense, would be supplied if needed.

Those parents who at this stage tentatively agreed to participate in the study were then mailed a short letter which summarized some of the points that had been made during the telephone conversation, and which gave the

names and on-campus telephone numbers of both the experimenter and his advisor. Together with this letter a permission form was sent which the parents were requested to complete and mail back in an enclosed, pre-paid, addressed envelope. This permission form also requested information regarding the father's occupation, the occupations of both paternal and maternal grandfathers, and the last level of formal education for both parents.

Those parents who were contacted initially by mail were sent a letter whose text paralleled the explanation given in the telephone conversations, together with the letter described above and the permission form. Copies of both this general circular letter and the permission form are provided in Appendix A.

This procedure of searching the census roles and then contacting the potential participants was continued until a sample of 150 willing families was obtained; 75 upper and 75 lower SES, with SES having been verified from the completed permission forms. The mean chronological age (CA) for the 150 children in this initial sample was 6.13 years (standard deviation 0.25 years), being calculated as of the time of phase two. Table 1 summarizes the information on CA, sex of subject, and SES for the upper and lower SES halves of the sample separately.

Table 1

SES, CA, and Sex of Subject for Upper and Lower SES Halves of Sample

	Lower SES		Upper SES	
	Phase One	Phase Two	Phase One	Phase Two
CA (years)	6.13	6.13	6.12	6.13
	(0.26)*	(0.25)	(0.25)	(0.25)
Sex				
Males	39	34	38	35
Females	36	30	37	29
Hollingshead SES of Father	31.92	32.05	70.49	70.17
	(2.62)*	(2.36)	(5.84)	(6.08)

* The upper figure is the mean and the figure in parentheses is the standard deviation for that table entry.

Phase One Procedure

As noted previously, the procedure adopted in phase one followed closely that used by Brophy (1970). At times and dates convenient to both the respective mother-child dyads and the experimenter, the mothers and children were transported to the University of Alberta for testing. As far as was possible subject pairs were scheduled at 20 to 30 minute intervals. Transportation was either by taxi or by the private means of the subjects. The children were screened for color blindness. This screening consisted of a simple questioning of the parent.

The experimental set-up was as diagrammed in Figure 1. The facilities used are situated in the Education Building, and they are normally used for various observational work. The experimental room was soundproofed, and the microphone was camouflaged in a decorative pendant hanging from the ceiling directly above the table.

Upon arrival, mother and child were shown into the experimental room and were seated at the table. The experimenter then chatted informally for a few minutes with both the mother and the child in order to put them at ease. Following this, the experimenter checked through the information on the returned Permission Form, clarifying any ambiguities or inconsistencies. The experimenter then

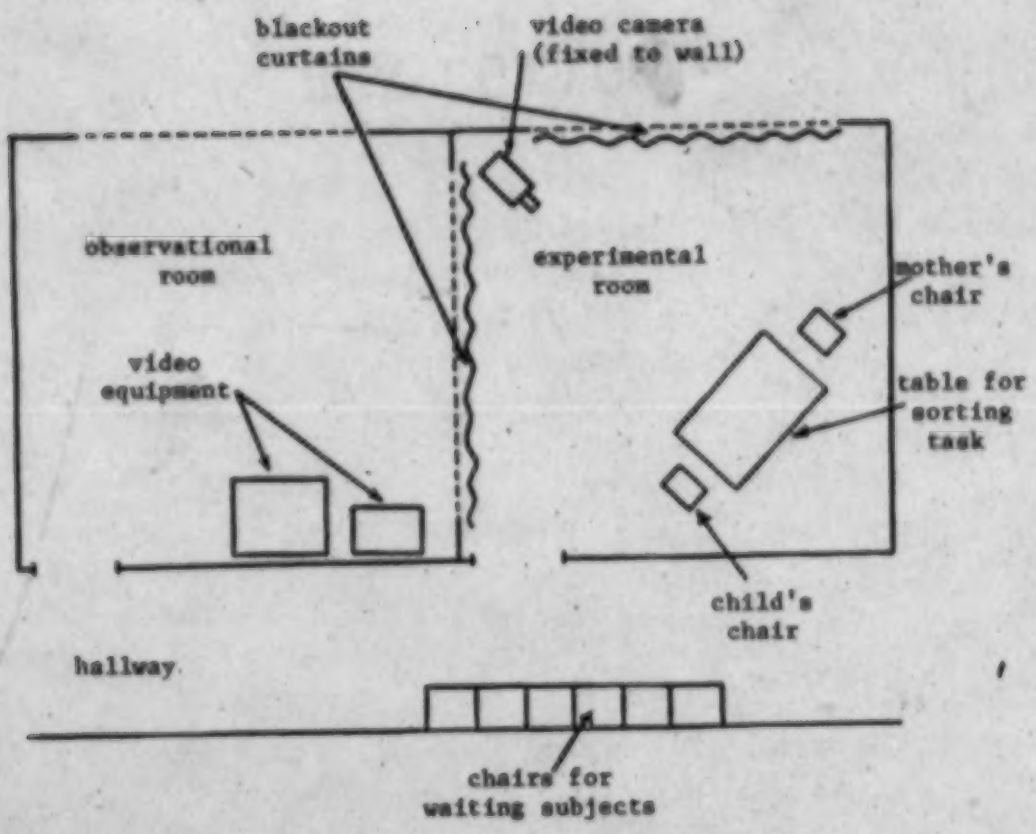


Fig. 1. Plan of facilities used in phase one.

asked the mother a series of questions relating to the use of English in conversation with the child, the kindergarten or pre-school experience of the child, the Albertan and Canadian residency of the family, and the urban or rural residency of the family. This information was recorded on the "Phase One Information Sheet" (see Appendix A). During this introductory section of phase one the blocks for use in the sorting task were covered by a large inverted cardboard box.,

Having established a friendly atmosphere, and having explained to the child that he was going to play a game with his mother, the experimenter then asked the child to wait out in the hallway for a moment while the game was first explained to the mother. The children readily complied with this request, quite often with some anticipatory excitement.

The mother was then given preliminary instruction with her child absent. She was told that the purpose of the overall experiment was to study the development of various problem solving skills across a wide cross-section of young children. It was explained that the purpose of the particular session about to begin was to observe a sample of the mother and her child doing something together. It was stressed that the session was not a test of any kind. The mother was requested to act as naturally as possible and to imagine that the whole situation was

occurring at home. She was assured that there was no one correct way of approaching the experimental task; the experimenter's interests being of a purely observational nature.

Along with this preliminary information, and still with her child absent, the mother was then tutored in the block sorting task that she was to teach her child. The materials for this task consisted of 12 wooden blocks. Six of these were three-inch cubes, and the other six were one-and-a-half-inch cubes. Also, six were painted black, and six were painted yellow. The colors were distributed so that there were three blocks in each of the four color-size combinations. The task consisted of sorting the blocks into their respective color-size categories. Special care was taken in tutoring the mother not to provide labels for the sorting attributes, but rather to prompt her to supply her own. This prompting procedure hopefully helped insure that the teaching strategies and attribute labels used by the mother were her own. A typical script of one of these preliminary instruction sessions is given in Appendix B.

Upon completion of the preliminary instruction and tutoring sessions, each mother was left alone with her child in the experimental room. The ensueing interaction with the mother teaching the child the sorting task was then recorded on video tape. The mother was fully aware

that the interaction was being recorded, it having been explained that the use of such recordings would allow the mother-child interactions to be scored at the experimenter's convenience and thus increase the schedule efficiency of the dyad observations.

In order to control for potential scoring biases the labeling of each of the dyad interaction recordings was coded. In this fashion each interaction could be scored without direct knowledge of the identity or SES of the subjects concerned. Since over 150 families were involved in the overall study, it seemed unlikely that the experimenter would be able to recognize any but a few subjects when scoring the video tapes.

That such a lack of recognition was indeed the case was supported by the findings of a scorer reliability check. Some four months after the initial scoring a random sample of 25 phase one recordings was re-scored. The resulting values for the 33 raw scores extracted from the dyad observations were correlated with their respective values obtained from the initial scoring. Fifteen of these reliability coefficients were greater than or equal to .90, six were between .89 and .80 inclusive, five were between .79 and .70 inclusive, three were between .69 and .60 inclusive, and only four fell below .60. Details of these reliability coefficients are given in chapter 5.

Mother Scoring

In line with the findings of Brophy (1970) that the tutoring behaviors of mothers could be typically structured into three basic categories, the behaviors of the mothers in this present study were also scored according to within which of these three categories they occurred. These three categories represented the three commonly occurring sections of the tutoring task, namely orientation, pre-response instructions, and post-response feedback. The orientation period occurred at the beginning of the mother's tutoring of her child, and involved the mother explaining and sometimes demonstrating the sorting task to the child. Pre-response instructions involved directions given by the mother to the child immediately prior to the child making a specific sorting response. Post-response feedback involved either confirmation or correction of the child's immediately preceding sorting response. Thus, the mothers' tutoring behaviors were scored and tabulated separately for each of these three structural categories. The raw scores for the mother behaviors are diagrammed in Figure 2.

Five raw scores were derived from the behaviors exhibited by the mother during the orientation period; one for the mother's presentation of the sorting concept "size", a similar one for the concept "color", one for the duration of the orientation period, and two relating to

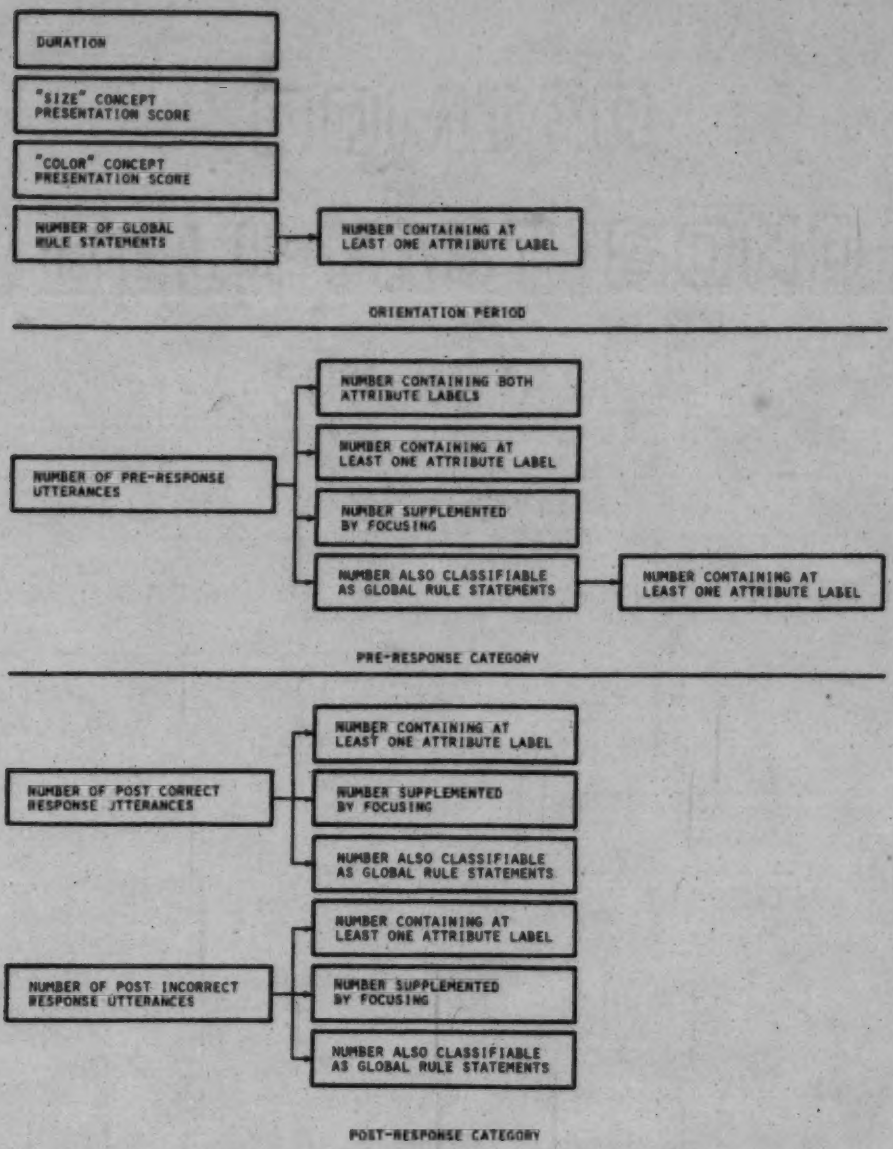

DURATION
"SIZE" CONCEPT PRESENTATION SCORE
"COLOR" CONCEPT PRESENTATION SCORE
NUMBER OF GLOBAL RULE STATEMENTS
NUMBER CONTAINING AT LEAST ONE ATTRIBUTE LABEL
ORIENTATION PERIOD
NUMBER OF PRE-RESPONSE UTTERANCES
NUMBER CONTAINING BOTH ATTRIBUTE LABELS
NUMBER CONTAINING AT LEAST ONE ATTRIBUTE LABEL
NUMBER SUPPLEMENTED BY FOCUSING
NUMBER ALSO CLASSIFIABLE AS GLOBAL RULE STATEMENTS
NUMBER CONTAINING AT LEAST ONE ATTRIBUTE LABEL
PRE-RESPONSE CATEGORY
NUMBER OF POST CORRECT RESPONSE UTTERANCES
NUMBER CONTAINING AT LEAST ONE ATTRIBUTE LABEL
NUMBER SUPPLEMENTED BY FOCUSING
NUMBER ALSO CLASSIFIABLE AS GLOBAL RULE STATEMENTS
NUMBER OF POST INCORRECT RESPONSE UTTERANCES
NUMBER CONTAINING AT LEAST ONE ATTRIBUTE LABEL
NUMBER SUPPLEMENTED BY FOCUSING
NUMBER ALSO CLASSIFIABLE AS GLOBAL RULE STATEMENTS
POST-RESPONSE CATEGORY

Fig. 2. Diagrammatic representation of raw scores used for phase one Mother Behaviors.

the types of utterances made by the mother. In the first of these the mother was scored "0" if she did not refer to the sizes of the blocks at all before the child made its first sorting response, "1" if she verbalized a label for size, "2" if she directed the child's attention to the size attribute at the same time as verbalizing the label, and "3" if she demonstrated the grouping of the blocks by the size attribute while verbalizing the label. A parallel scoring procedure was used for the concept "color". Orientation time was recorded from the beginning of the mother's tutoring, usually the point at which the blocks were uncovered, until the child was first asked by the mother to make a specific sorting response.

The fourth raw score for the orientation period was a count of the number of utterances made by the mother that could be classified as global rule statements as per the definition in chapter three. The fifth score was a count of the number of these global rule statements that also contained at least one attribute label. For analysis, this fifth score was also expressed as a proportion of the fourth.

The behaviors exhibited by the mother in the pre-response instructions category were analyzed to yield six raw scores. These scores were as follows: 1) the number of distinct pre-response utterances made by the mother; 2) the number of these pre-response utterances that contained

labels for both sorting attributes; 3) the number of these pre-response utterances that contained at least one attribute label; 4) the number of these pre-response utterances that were supplemented by focusing, either verbal or gestural; 5) the number of these pre-response utterances that were also classifiable as global rule statements; and 6) the number of these pre-response utterances-cum-global rule statements that contained at least one sorting attribute label. For analysis purposes, scores 2, 3, 4, and 5 were also expressed as proportions of score 1; and score 6 was also expressed as a proportion of score 5.

In the post-response feedback category eight raw scores were derived. Four of these scores were as follows: 1) the total number of post correct response utterances made by the mother; 2) the number of these post correct response utterances that contained at least one sorting attribute label; 3) the number of these post correct response utterances that were supplemented by focusing; and 4) the number of these post correct response utterances that were classifiable as global rule statements. The remaining four raw scores paralleled scores 1 through 4, but were derived from the post incorrect response utterances made by the mother. For analysis, scores 2, 3, and 4 were also expressed as proportions of score 1; with parallel proportions being

calculated for scores 5 through 8.

The scoring of each mother's phase one behaviors was conducted using the scoring blank labeled "Phase One Score Sheet--Mother". A copy of this blank is reproduced in Appendix A.

Child Scoring

Although not as pertinent to the central aims of this study as were the tutoring behaviors of the mothers, the behaviors exhibited by the children during phase one were nevertheless also scored. The prime reason for this scoring was that it was thought that an analysis of the children's phase one behaviors might provide useful information for the later interpretation of the overall study.

The child behavior scoring was structured to parallel that for the mother behavior. However, where the mother behavior categories of pre- and post-response were natural divisions separated by the child's response, no such separation seemed inherently obvious for the child behaviors. Consequently, the child behaviors were scored with respect to only two categories; namely, orientation (being defined the same as for the mother behavior category), and sorting responses (being everything that occurred from the first sorting response on). The child behavior raw scores are diagrammed in Figure 3.

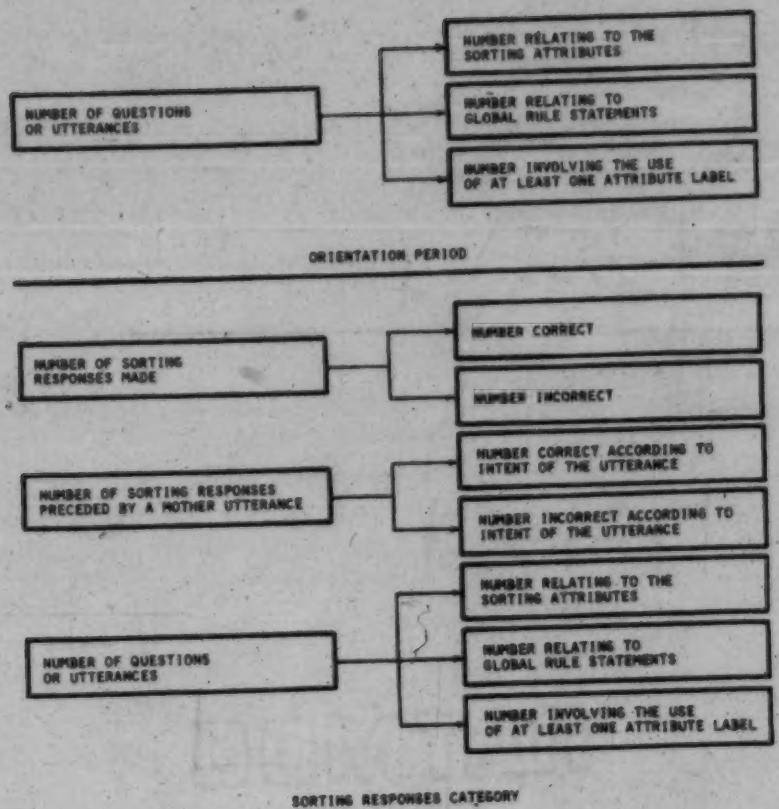

NUMBER OF QUESTIONS OR UTTERANCES
NUMBER RELATING TO THE SORTING ATTRIBUTES
NUMBER RELATING TO GLOBAL RULE STATEMENTS
NUMBER INVOLVING THE USE OF AT LEAST ONE ATTRIBUTE LABEL
ORIENTATION PERIOD
NUMBER OF SORTING RESPONSES MADE
NUMBER CORRECT
NUMBER INCORRECT
NUMBER OF SORTING RESPONSES PRECEDED BY A MOTHER UTTERANCE
NUMBER CORRECT ACCORDING TO INTENT OF THE UTTERANCE
NUMBER INCORRECT ACCORDING TO INTENT OF THE UTTERANCE
NUMBER OF QUESTIONS OR UTTERANCES
NUMBER RELATING TO THE SORTING ATTRIBUTES
NUMBER RELATING TO GLOBAL RULE STATEMENTS
NUMBER INVOLVING THE USE OF AT LEAST ONE ATTRIBUTE LABEL
SORTING RESPONSES CATEGORY

Fig. 3. Diagrammatic representation of raw scores used for phase one Child Behaviors.

For the orientation period, four raw scores were derived from observation of the child behaviors. These scores were: 1) the total number of questions asked or utterances made by the child during the orientation period; 2) the number of these questions-cum-utterances that related to the sorting attributes; 3) the number of these questions-cum-utterances that related to global rule statements; and 4) the number of these questions-cum-utterances that involved the use of at least one sorting attribute label. For analysis purposes, scores 2, 3, and 4 were also expressed as proportions of score 1.

For the sorting responses category, a total of 10 raw scores were derived from the child behavior data; these 10 scores being grouped into three subdivisions. The first of these subdivisions contained three raw scores: 1) the total number of sorting responses made by the child; 2) the number of these sorting responses that were correct; and 3) the number of these sorting responses that were incorrect. For analysis, scores 2 and 3 were also expressed as proportions of score 1. Further, score 1 from the mother behavior post-response category was expressed as a proportion of score 2 above, yielding a measure of the frequency with which post correct response feedback was given by the mother. A similar proportion was also calculated for post incorrect response feedback using score 5 from the mother behavior post-response category

and score 3 above.

The second subdivision in the child behavior sorting responses category contained three raw scores: 4) the total number of sorting responses made by the child that were preceded by a distinct pre-response utterance from the mother; 5) the number of these preceded responses that were correct according to the intent of the mother's pre-response utterance; and 6) the number of these preceded responses that were incorrect according to the intent of the mother's pre-response utterance. For analysis, scores 5 and 6 were also expressed as proportions of score 4. Further, score 4 was expressed as a proportion of sorting response score 1 above to yield a measure of the frequency with which the child's sorting responses were preceded by an utterance from the mother.

The final subdivision in the child behavior sorting responses category contained four raw scores: 7) the total number of questions asked or utterances made by the child during the sorting responses period; 8) the number of these questions-cum-utterances that related to the sorting attributes; 9) the number of these questions-cum-utterances that related to global rule statements; and 10) the number of these questions-cum-utterances that involved the use of at least one sorting attribute label. For analysis, scores 8, 9, and 10 were also expressed as proportions of score 7.

The scoring of each child's phase one behaviors was conducted using the scoring blank labeled "Phase One Score Sheet--Child". A copy of this blank is reproduced in Appendix A.

Phase Two Procedure

Subject Selection

Using a ranking procedure the upper and lower SES mothers from the phase one sample were divided, separately, into relative high and low providers of label verbalizations and attentional focusing behaviors. This ranking procedure involved the calculation of a Composite Mother Verbal Score (CMVS) through use of a formula based on the mother behavior scoring from phase one. This formula is presented in Table 2.

The use of this formula for calculating the CMVS gave effective weightings of 40% to the orientation duration, 24% to the combined orientation concept presentation scores, 24% to the orientation global rule statement proportion together with the five pre-response mother scoring category proportions, and 12% to the six proportions from the post-response mother scoring category. These weightings were set so as to reflect, first, the findings of Brophy (1970) as to which of the variables best distinguished between upper and lower SES

Table 2

Formula for Calculating Composite Mother Verbal Score (CMVS)

from Phase One Mother Behavior Data

CMVS = (Orientation duration time variable)*

+ 4(Sum of orientation "size" and "color" scores)

+ 4(Proportion of orientation global rule statements containing at least one attribute label

+ Proportion of pre-response utterances containing at least one attribute label

+ Proportion of pre-response utterances containing both attribute labels

+ Proportion of pre-response utterances supplemented by focusing

+ Proportion of pre-response utterances that were classifiable as global rule statements

+ Proportion of pre-response utterances-cum-global rule statements containing at least one attribute label)

+ 2(Proportion of post correct response utterances containing at least one attribute label

+ Proportion of post correct response utterances supplemented by focusing

+ Proportion of post correct response utterances classifiable as global rule statements

+ Proportion of post incorrect response utterances containing at least one attribute label

+ Proportion of post incorrect response utterances supplemented by focusing

+ Proportion of post incorrect response utterances classifiable as global rule statements)

* Orientation duration time variable = ½(actual orientation time in seconds), up to a maximum value of 40 for the variable.

mothers, and second, those variables which were of most theoretical importance in terms of the argument underlying the present study.

That is, mother practices such as label provision, attentional focusing, and the provision of global rule statements, are each argued to be functionally important in the development of mediatory processes in the child. Since these practices would seem to be essentially pre-response or stimulus control factors, the greater weightings in the CMVS calculation were given to those variables reflecting the pre-response or stimulus control components of the phase one dyad observations, namely those of the orientation and pre-response categories.

When a CMVS had been calculated for each of the 150 mothers from the initial sample for phase one, this score was then used to rank the 75 upper SES mothers and, separately, the 75 lower SES mothers. The children of the top and bottom ranked 32 mothers from each SES group were selected to form the four basic experimental groups for phase two; upper SES-high CMVS (HiSES-HiV), upper SES-low CMVS (HiSES-LoV), lower SES-high CMVS (LoSES-HiV), and lower SES-low CMVS (LoSES-LoV).

At this stage it should be noted that while the above was the basic procedure for selecting the 128 child subjects for phase two, unforeseen problems that arose during the running of the first few subjects caused three

HiSES-HiV, three HiSES-LoV, three LoSES-HiV, and two LoSES-LoV subjects to be lost. These lost subjects were replaced from the appropriate ends of the ranked 11 subject "middle remainders" in their respective SES groups. Consequently, even though the CMVS separations between the eventual experimental groups were not as large as would have ideally been desired, these separations nevertheless remained intact. The compositions of the basic experimental groups were thus not fundamentally affected by these unfortunate subject replacements. The mean CMVSs for each of the four basic experimental groups actually used in phase two are listed in Table 3.

The problems that caused this subject loss related to the procedures for presenting the phase two experimental tasks. As has already been mentioned, an IBM 1500 CAI system was used for this portion of the study. The preliminary instructional sequence which had been developed to train the subjects in the response mode required by this CAI system proved to be inadequate; even though such inadequacies were not apparent during earlier pilot work. Consequently, the experimental tasks proved too difficult for the 11 subjects involved in this first run; motivation and concentration suffering accordingly.

Further, in this initial run the subjects had been scheduled to begin the experimental tasks simultaneously, each subject at his own individual terminal. Unfortunately

Table 3

Mean CMVSs for Basic Experimental Groups

(Each Group N=32)

	LoV	HiV
Upper SES	19.59*	44.17
	(6.80)	(11.17)
Lower SES	20.41	34.78
	(5.96)	(6.40)

* For each table entry, the upper figure is the mean and the figure in parentheses is the standard deviation.

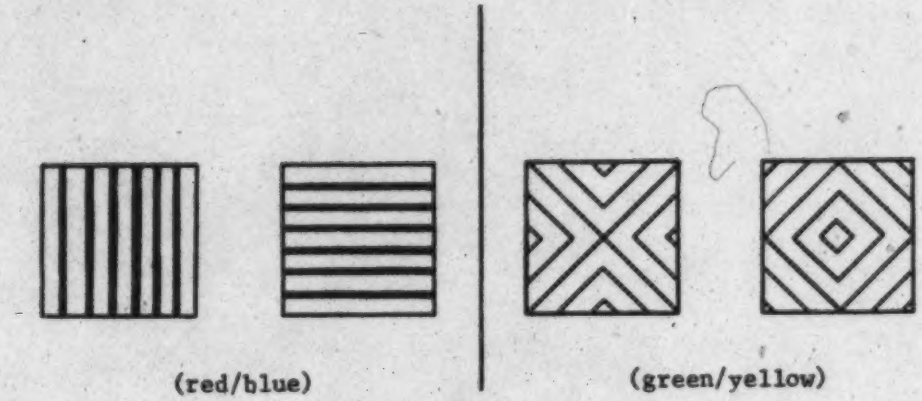
this arrangement also meant that the subjects began to experience difficulties simultaneously, and the experimenter thus found it impossible to effectively deal with each subject's problem as it arose.

The preliminary instructional sequence and the scheduling of subjects were subsequently revised and retested in further pilot work, and an incentive was introduced in order to boost motivation and concentration. The procedures which were finally used in administering phase two are described in detail later in this chapter.

Experimental Tasks

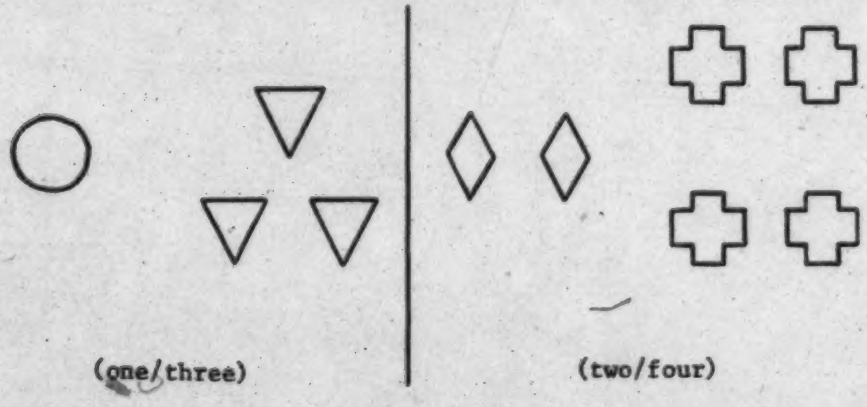
As noted previously, the two tasks administered in phase two each involved ID and ED visual discrimination shifts within a total change paradigm (Slamecka, 1968). Color and shading pattern were the variable within-trial relevant dimensions for the first task, while for the second task shape and number were used. For both tasks, completely new stimulus cue values were used for pre- and post-shift sections (see Figure 4). Size was a constant dimension throughout, and position was a variable within-trial irrelevant dimension.

In the pre-shift section of the first task each subject was presented with a series of stimulus pairs via an image projector. Each pair consisted of two color-shading patches, one red and the other blue, one shaded



(red/blue) (green/yellow)

First Experimental Task



(one/three) (two/four)

Second Experimental Task

Fig. 4. Stimuli used in the experimental tasks of phase two.

vertically and the other horizontally. For half the subjects color was the relevant dimension, with shading being relevant for the remainder. Upon presentation of each stimulus pair, a subject was required to select one member of the pair by pushing a light stylus against the appropriate area on a cathode ray tube (CRT) screen display. If the selection made was correct, feedback was administered via a constant tone (700 cps) of one second duration heard through a set of earphones worn by the subject. If the response was incorrect, no feedback signal occurred. Each stimulus presentation trial continued in like manner until a criterion of 10 consecutive correct responses was reached.

Following the attainment of criterion on the pre-shift section, the subject was immediately shifted to a new discrimination task involving new stimulus cues for both color and shading pattern dimensions (green-yellow and diamond-diagonal). For half the subjects within each of the four basic experimental groups the post-shift section involved an ID shift, with the relevant dimension being the same as that for the pre-shift section. For the remainder, an ED shift occurred, with the pre-shift irrelevant dimension now becoming relevant. Stimulus cues were counterbalanced within both dimension and shift type, but were tied between pre- and post-shift. Also, dimensional counterbalancing was used to counteract any

possible preference effects, although such effects have by no means been unambiguously demonstrated in the research literature (Shepp & Turrisi, 1967). Trials for the post-shift section were administered in the same manner as for the pre-shift section, until the subject again attained the same criterion of 10 consecutive correct responses.

In the second shift task, which followed the intervening training condition mentioned previously, the procedure was identical to that for the first above except that new stimulus dimensions were used throughout (see Figure 4). Within each basic experimental group subjects were counterbalanced as to their being administered either the same or a different shift to that given them in the first experimental task. Such a procedure hopefully counteracted any extraneous practice effects transferring from the first to the second shift task.

Also, within the second shift task, counterbalancing was of the same format as that for the first shift task, but both second task dimensions and second task pre-shift cues were tied to their respective first task counterparts. Since there was no obvious inherent relationship between the first and second task stimulus dimensions, this tying procedure served both to keep the study from becoming unnecessarily complicated as well as to keep the sample size down do a workable minimum. The diagram in Figure 5 outlines the complete counterbalancing

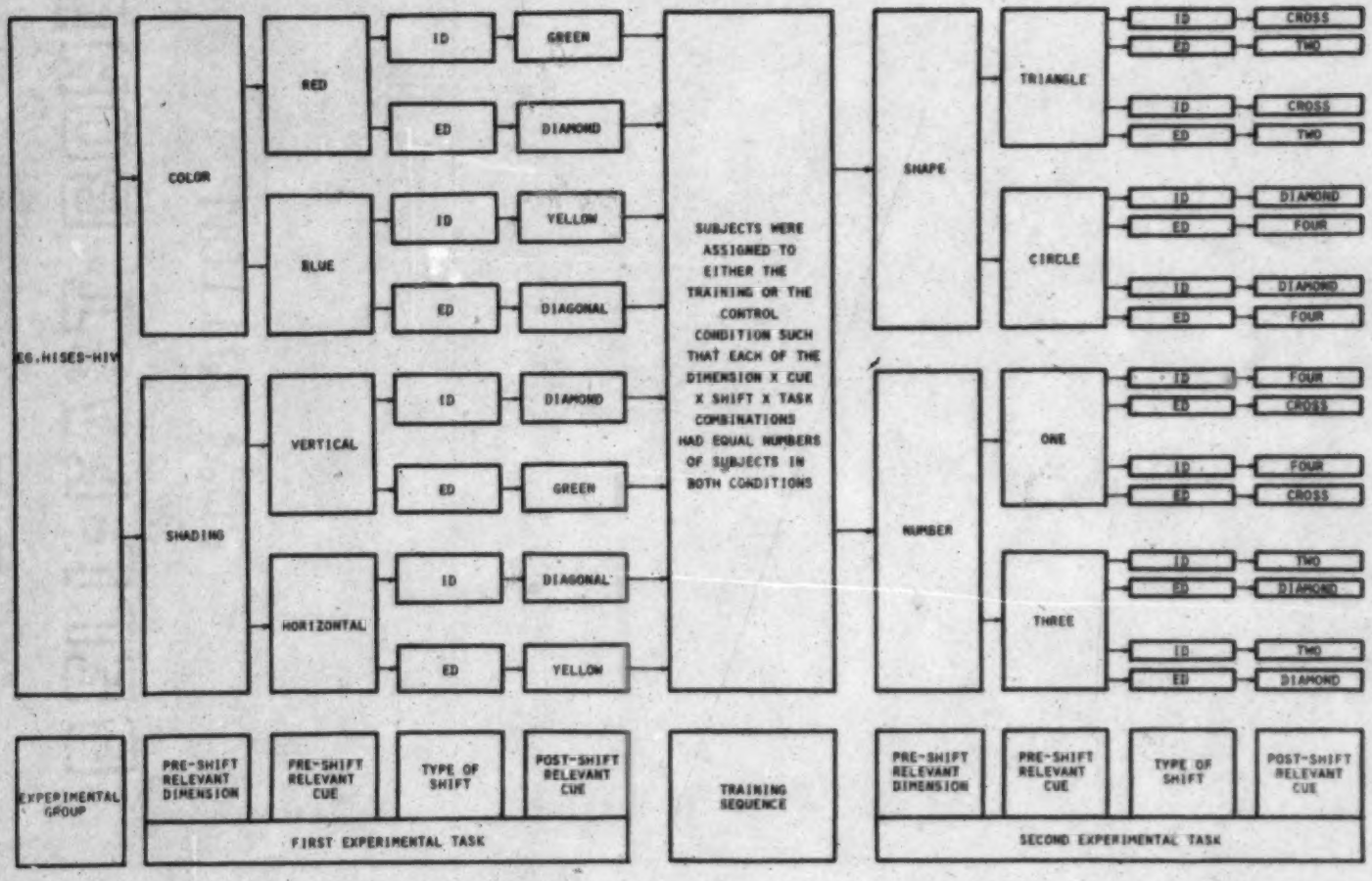


Fig. 5. Format for phase two procedure, duplicated across experimental groups. To determine the route of any one subject, read from left to right maintaining the same level.

procedures used in this study.

Within each section of the two tasks, and for each of the two separately relevant dimensions for each of the two tasks, the order of presentation of the stimulus pairs was such as to minimize the likelihood of any subject attaining criterion through the use of an incorrect response strategy (Gellerman, 1933). Using A, B, C, and D to represent the four distinct stimulus pairs of any one of the dimensional permutations used, the order model for the 60 trial presentational cycle was as follows: D A B D C B A D C B A C D B C A D A B C B D A C B C D A B D C B A C D A D B C A B C D A B D A C B D C A B D A C B C D A.

Administration of Phase Two

A Coursewriter II program was developed by the author for presenting the phase two experimental tasks via the IBM 1500 CAI facility located in the Division of Educational Research Services at the University of Alberta. In its final form this program consisted of some 27,000 lines of programming, and it automatically administered the entire phase two sequence, keeping complete records of each of 1) responses made, 2) latencies, and 3) elapsed times. The program is currently stored in the library of the Division, its course name being DISCS. The User Documentation for the program, and a description and copy of the macro (a programming block

used in programming redundant sections) used in the initial programming, are reproduced in Appendix B.

Following formation of the four basic experimental groups as described previously, the 128 children that constituted the subjects for phase two were transported, by either pre-paid taxi or by the subjects' private means, to the University for testing. The scheduling of these visits was designed to accommodate both the convenience of the parents and the availability of the CAI facility. Except for one day-long Saturday session, most subjects were tested on a weekday evening in the 6:00 to 8:00pm time period. For any one session, the subjects were scheduled to begin the experimental tasks at the rate of three subjects every 15 minutes. The time needed for one subject to complete the two experimental tasks ranged from about 20 minutes up to about two hours, with a modal completion time of about 40 to 45 minutes.

Upon arrival at the CAI facility each parent and subject were greeted and thanked for their co-operation. The parent was asked to wait outside and the subject was ushered into the terminal room. Since the terminal room was equipped with one-way viewing windows, the parent could observe the entire phase two procedure without in any way interrupting the subject.

Once in the terminal room the subject was shown an array of 10 cent candy bars, and was asked to choose the

bar that he liked most. Having made his selection, the subject was then told that the candy bar would be set aside for him, and that if he won the game he was about to play with the computer, then he could have the candy bar. The subject was then seated at his respective terminal, being placed in front of the image projector, and the experimenter, or one of his assistants, signed the subject onto the DISCS program.

Two studies (Jeffrey & Cohen, 1964; Murphy & Miller, 1959) which investigated the effects on visual discrimination learning of varying degrees of stimulus-response-reinforcement spatial separation both found that the situation having complete spatial contiguity was the most superior. These findings held throughout the entire 41 months to grade four CA range in subjects used. In the present study, the CAI facility unfortunately did not allow for stimulus-response spatial contiguity. However, the use of earphones for the feedback signal necessarily meant that this signal must have been psychologically contiguous with at least the response. Further, pilot work indicated that placing the subject in front of the stimulus locale (the image projector) rather than the response locale (the CRT) minimized the disruptive effects of this unavoidable stimulus-response spatial separation. The positioning of the subject at the CAI terminal is diagrammed in Figure 6.

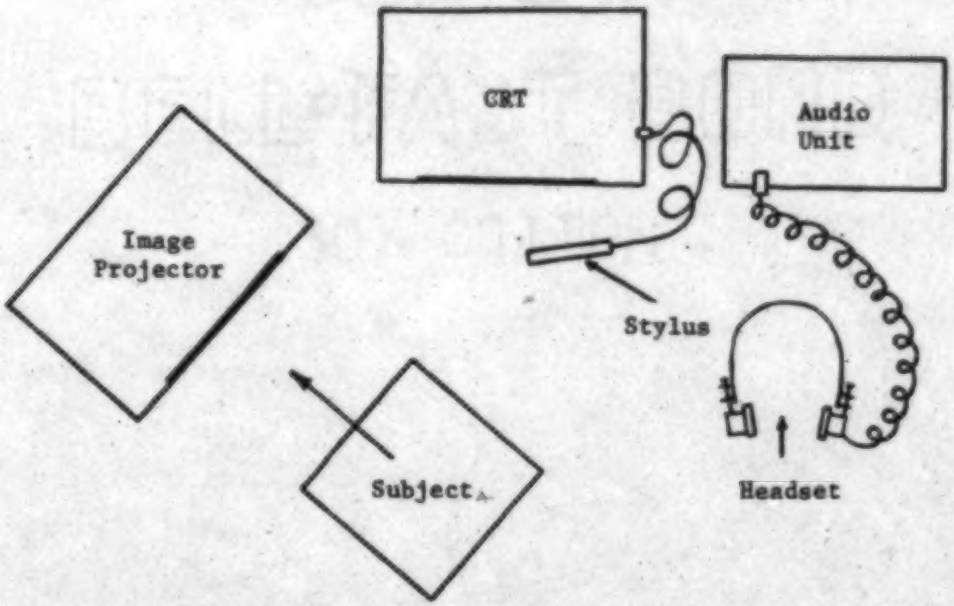


Fig. 6. Planview of subject seated at CAI terminal.

Immediately following signon, DISCS presented an example stimulus presentation on the image projector (IP), together with the response pattern on the CRT screen. This situation is diagrammed in Figure 7. The stimulus pair used was one of those used later in the pre-shift section of the first task.

The experimenter then proceeded to use these example presentations to train the subject in the experimental tasks and the response mode to be used. The subject was told that in the game the computer would present a series of pairs of pictures on the IP, each pair looking something like that being presently shown. It was explained that the computer would have already decided which picture in each pair was going to be correct, and that the game was to try and find out which of each pair these correct pictures were. The one rule to the game was that the correct picture in each pair was always the same in some one way. To win the game, the subject was told that he had to be able to eventually get all his choices correct, one after the other, all in a row.

To train the subject in the response mode, it was first explained that since computers did not have ears some method other than telling had to be found to let the computer know the subject's choices. The subject was told that the method to be used in the game involved the pictures on the CRT screen and the light stylus. To tell

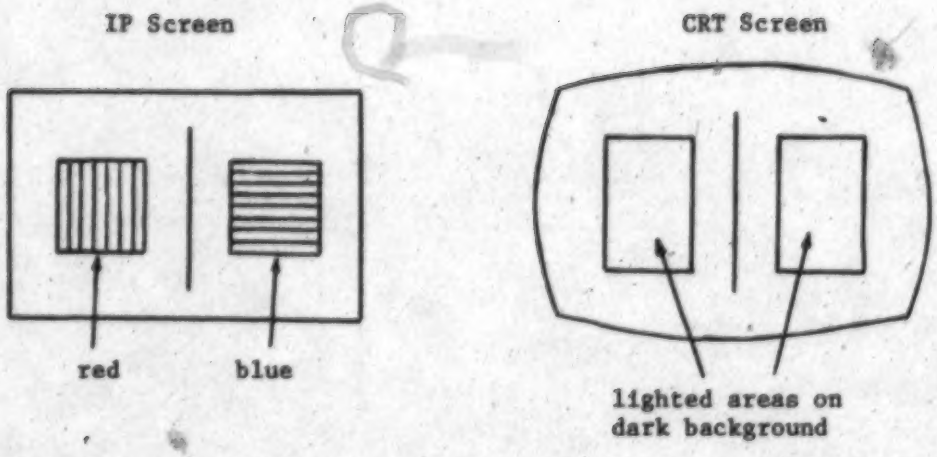


Fig. 7. Subject's view of IP and CRT showing example stimulus pair presentation on IP screen and response pattern on CRT screen.

the computer which picture had been chosen, the stylus was to be pressed against the lighted area that was in the same relative position on the CRT screen as was the chosen picture on the IP screen.

This response mode was demonstrated using a guided practice procedure. The experimenter placed the stylus in the subject's right hand, and then took both the subject's hands in his own. The procedure went roughly as follows: "If you want to choose the picture that is here,"--experimenter points subject's left hand at, for example, the right hand member of the stimulus pair on the IP--"whatever that picture might look like, then you tell the computer by pressing here."--experimenter guides subject's right hand to press the stylus against the right hand lighted area on the CRT. This procedure was repeated a few times, each with lessening guidance, until the subject could independently perform the response mode without error.

The subject was next practised in making actual selection responses. For instance, the experimenter would ask the subject to pretend that he thought the red picture was correct and to then tell the computer of that choice. This procedure was continued, giving equal use weighting to each of the color and shading pattern cues respectively, until the subject had properly made at least four distinct selection responses.

At this stage the experimenter told the subject that he was now about ready to play the game. It was explained that first the computer would talk a little bit about how to play, and that the subject should thus listen very carefully to what the computer voice said, following any directions that it might give. The subject was then reminded of what the rule of the game was, of what he had to do to win, and of the candy bar that awaited as his prize. The audio unit headset was then fitted onto the subject, and the experimenter typed in a message on the terminal keyboard to re-activate DISCS. This individual tutoring took about 10 minutes for each subject.

Following the re-activate message, DISCS conducted the subject through a short preliminary training sequence. This sequence revised the training that had occurred in the just preceding individual tutoring session, and it also demonstrated the feedback signal that would be used to indicate response correctness in the experimental tasks to follow. As has already been noted, a correct selection response was followed by a one second beep tone, whereas an incorrect selection response was followed by no signal at all.

If during this preliminary training sequence the subject consistently made errors during practice trials, indicating that he had not fully understood the training instructions, then DISCS automatically typed a locating

error message on the CRT screen, and paused until a re-start message was entered. This pause allowed the experimenter to rectify the subject's problem. The script of this DISCS preliminary training sequence is reproduced in Appendix B.

For the individual tutoring as well as the brief preliminary DISCS training, the stimulus pairs used in the training trials were the actual stimulus pairs that would later be used in the pre-shift section of task one. The rationale for this procedure was that if different dummy stimulus pairs had been used, then the possibility would have arisen of problems relating to the transfer of the training to the actual experimental task. Consequently, it was decided that so long as each stimulus cue and each stimulus dimension was given equivalent use weighting during these training trials, then it would be best to use the actual experimental stimuli in training and thus hopefully maximize its transfer effectiveness.

Upon completion of the preliminary training sequence, DISCS administered the first of the two experimental shift tasks. DISCS was programmed such that the CRT response pattern was present only from the instant of stimulus pair presentation until the instant of the subject's selection response. Immediately following the subject's response the CRT went blank, remaining so until the presentation of the next stimulus pair. This procedure effectively both

discouraged subjects from leaving the stylus pressed against the CRT, and differentiated one trial from the next.

Half the subjects in each of the four basic experimental groups went into an ID shift task and the other half into an ED shift task. In making these splits care was taken to ensure that, as far as was possible, each half-group remained equivalent to its partner in terms of the mothers' CMVSs from phase one. Each subject was thus administered his respective first task with the appropriate dimensional and stimulus cue counterbalancing as previously described.

While the subjects were working through this first task, the experimenter and his assistants moved about the terminal room, checking to see if any subject was having what appeared to be inordinate difficulties. Those difficulties that did arise could be roughly categorized into two areas. The first included difficulties arising from the subject's not having mastered the response mode. These difficulties were very easily solved with a brief on-the-spot training session. For instance, as the next stimulus pair was presented on the IP, the experimenter would ask the subject which of the pair the subject thought was correct. When the subject had indicated his choice, the experimenter would then ask where the subject had to point in order to notify the computer of this

decision. In such fashion successive trials were executed until the experimenter observed that the subject could respond independently and appropriately.

The second area of subject difficulties included those arising from the failing concentration of the subject. In these instances the experimenter would sit with the subject for a while, reminding him intermittently of the rule that the correct picture in each stimulus pair was always the same in some single aspect, of the criterion for winning the game, and of the candy bar that would be his if he did in fact win. This procedure proved effective in all instances, although it should be noted that for quite a few subjects (about 15 to 20 percent) the time spent at such boosting was rather extensive. However, it was found that these concentration lag difficulties occurred predominantly only during the pre-shift section of the first task. Once the first criterion had been attained, and thus some measure of success had been experienced, only a very few subjects continued to exhibit this difficulty.

An explanation for these concentration difficulties might lie in the possible inadequacy of the preliminary training. Thorough though it appeared to be, this training may still have left some subjects unsure as to what was the aim of the game. Consequently, for these subjects, it was not until the attainment of the first criterion that

the notion of winning the game was fully understood.

Partial support for this explanation comes from correlations relating the date upon which a subject completed phase two and the performance of the subject in the pre- and post-shift sections of each experimental task. As can be seen from Table 4, the correlations for the pre-shift task one performance were negative and low, but significant. The interpretation of these correlations is that the trials-to-criterion and the elapsed-time-to-criterion variables both tended to be higher, and thus performance poorer, for those subjects who were run early than for those who were run late. Each of the other correlations were effectively zero.

Thus it would seem that the individual tutoring given by the experimenter and his assistants improved slightly with practice. Further, if this tutoring improvement was in fact the case, then it would seem that the adequacy of such individual tutoring was unrelated to subject performance beyond the attainment of the first criterion; an interpretation which fits the explanation hypothesized above to account for the concentration difficulties exhibited by some subjects.

As a note, it can be suggested here that the occurrence of such subject concentration difficulties as were encountered in this study points out what is perhaps a major drawback in the use of the IBM 1500 CAI system for

Table 4

Correlations between Phase Two Performance and Date of Phase Two (N=128)

		Trials-to-criterion	Elapsed-time-to-criterion
Task 1	Pre-shift	-.17*	-.17*
	Post-shift	-.06	-.07
Task 2	Pre-shift	-.03	-.05
	Post-shift	+.06	+.07

* significant beyond the .05 level.

psychological research with children. The main point in favor of using the CAI system is that it allows many subjects to be run simultaneously. However, children are often a distracting influence upon other children, especially so when concentration lags for whatever reason. Some method of isolating each individual terminal would seem necessary.

Upon completion of the first experimental task each subject was assigned to either an intervening training condition or a no-training control condition. This training-versus-control split was made such that first, each of the eight half-groups from the pre-shift section of task one were each again halved into training and control subjects, and second, as far as was possible CMVS equivalence was maintained between the respective half-groups.

The 64 training condition subjects were each shown, twice, a short (approximately five minutes) super 8mm color film demonstrating the use of cognitive mediatory processes in the solution of visual discrimination tasks. This film showed an adult model, at one of the CAI terminals, solving a visual discrimination task similar to that which had constituted the pre-shift section of the first experimental task just completed. The model was shown simultaneously verbalizing his mediatory solution processes. The sound track for the film was provided via a

synchronized audio tape cassette. This film is available from the author upon request.

The training film was shown in another room in the same building as the CAI facility. This meant that as each training subject completed the first experimental task he could be sent straight away, accompanied by his parent, to the film room. The film was shown by an assistant of the experimenter.

The procedure for showing this training film was as follows. Before the first screening the operator-assistant would say; "You are going to see a little film showing a person playing a game like the one that you have just finished. The voice is the person thinking aloud. This person played the game very well, so you should watch the film very carefully and see if you can see how he played the game." At the end of the first screening the operator-assistant would say; "I'll rewind the film and we will watch it again. Watch it carefully to see how to play the game well." At the end of the second screening the operator-assistant would say; "Now you go back up to the computer to see how well you can play another little game." A complete script of the film is reproduced in Appendix B.

The rationale for this training condition stemmed from the work of Ryan and Kobasigawa (1971) and Kobasigawa (1970). Using kindergarten and grade two children

performing concept identification tasks similar to the tasks used in this study, the findings from this work indicated that such verbalizing model sequences could reasonably be expected to lead to the observing child acquiring generalized solution strategies.

The technical aspects of the film's production followed the organizational principles outlined by Sheffield and Maccoby (1961). The angle of view was over the shoulder of the model so as to obtain maximum similarity to the subject's own actual view. Soundtrack descriptions by the model of his own actions always slightly preceded those actions. The specific stimulus cues and dimensions being responded to by the model were always named using appropriate attribute labels; statements such as "this one" never being used in isolation.

The 64 control condition subjects were simply given a rest period of similar duration (about 10 minutes) to the time spent by the training subjects viewing their film. As each control subject completed task one he was taken to his parent outside the terminal room. The parent was told that the subject was to have a rest period of about 10 minutes, and that they could perhaps go for a walk around the building, get a drink, or go to the toilet.

Following completion of the training-control segment, each subject was seated back at his terminal and DISCS was

re-started. The subject was first conducted through a very short introduction and revision sequence which informed the subject that the rules for the game to follow were the same as those for the game just finished. A script of this sequence is reproduced in Appendix B. DISCS then administered the second experimental shift task.

Within each of the four basic experimental groups, half of the subjects who were administered an ID shift in the first experimental task were given an ED shift in the second, the remainder being given another ID shift. A parallel situation prevailed for those subjects given an ED shift in the first task. The grouping of subjects and the counterbalancing of the stimulus dimensions and cues for the administration of task two was as is diagrammed in Figure 5, which was presented previously. As with task one, the experimenter and his assistants monitored the subjects to ensure that no subject having inordinate difficulties went unattended.

Upon completion of task two, the subject was congratulated for winning the game, given his candy bar, and taken out to his parent. The parent was thanked for his/her participation in the study, and was told that when the results of the study had been analyzed and interpreted a resume of the findings would be mailed out.

CHAPTER FIVE

Analysis and Results

The analyses reported here were performed almost entirely using computer programs from the Division of Educational Research Services library, and from the Statistical Package for the Social Sciences library; both housed with the University of Alberta Computing Services. The major references for the analyses were Hays (1963) and Winer (1962).

SES Comparisons on the Phase One Demographic Data

The information received from the parents via the Permission Form and from the preliminary informal interview that preceded phase one was tabulated, separately, for each of the upper and lower SES halves of the initial phase one sample. The two halves were then compared on each of the 16 demographic variables involved. These comparisons are summarized in Table 5. Note that the comparisons between these two half samples on each of father's SES, CA of child, and sex of child were reported previously in Table 1.

The tests of the statistical significance of the SES differences in Table 5 were performed using two-tailed t

Table 5

Summary of Demographic Comparisons between Upper and Lower SES Halves of Phase One Sample using Two-tailed t Tests for Non-correlated Samples

		Lower SES	Upper SES	
1. Number of children in family	Mean	2.24 (.77)	2.47 (.70)	ns
	Mode	2 (42)	2 (37)	
2. Father's education @	Mean	1.15 (1.22)	3.75 (.72)	***
	Mode	0 (34)	4 (62)	
3. Mother's education @	Mean	1.75 (1.32)	3.41 (.76)	***
	Mode	3 (25)	4 (40)	
4. Mean Blishen SES on paternal grandfather		34.50 (7.69)	47.04 (14.09)	***
5. Mean Blishen SES on maternal grandfather		34.22 (7:88)	45.78 (13.24)	***
6. Status of English Only language	Number	58	65	
Other also	Number	17	10	
7. Mean proportion of conversation with child in English as reported by parent		.96 (.13)	.99 (.04)	ns
8. Number of children having kindergarten or playschool experience		56	71	
9. Mean years kindergarten or playschool attendance for those attending		1.09 (.35)	1.59 (.82)	***

Table 5 continued on next page.

Table 5 (Continued)

		Lower SES	Upper SES	
10. Years of last 10 mother resident in	Mean	9.12 (1.90)	8.55 (2.29)	ns
	Mode	10 (57)	10 (48)	
11. Years of last 10 mother resident in Canada	Mean	9.85 (.90)	9.25 (1.72)	**
	Mode	10 (73)	10 (60)	
12. Years of last 10 mother resident in urban setting	Mean	8.96 (1.89)	9.77 (.78)	***
	Mode	10 (53)	10 (68)	
13. Years of last 10 mother resident in English speaking community	Mean	9.93 (.58)	9.92 (.49)	ns
	Mode	10 (74)	10 (73)	
14. Mean years child resident in Alberta		5.53 (.70)	5.41 (.84)	ns
15. Mean years child resident in Canada		5.69 (.49)	5.51 (.71)	ns
16. Mean years child resident in urban setting		5.37 (.66)	5.63 (.49)	ns

Note: for means, figure in parentheses is standard deviation; for modes, it is the number of subjects at that score.

@ Scale used for parental education ratings was as follows: 0=grade 9 or below; 1=grade 10; 2=grade 11; 3=grade 12/13; and 4=formal tertiary (ie. programs normally having a grade 12/13 entrance requirement, and excluding such things as apprenticeship training and extension courses).

ns difference not significant beyond at least the .05 level.
** difference significant beyond the .01 level.
*** difference significant beyond the .001 level.

tests for non-correlated samples. Since the two half samples were of equal size, and since they were each relatively large (N=75 in each case), considerations of homogeneity of variance and of distributional normality could safely be ignored in performing these tests (Hays, 1963).

As would be expected, parental education for both mothers and fathers was significantly higher in the upper than in the lower SES half sample. Also, the mean occupational ratings for paternal and maternal grandfathers on the Blishen SES scale were both significantly greater for the upper than for the lower SES half sample.

The upper SES half sample contained more monolingual anglophones than did the lower SES. However, there was no significant difference found between the two half samples with respect to the mean proportion, as reported by the parents, of conversation with the child that was conducted in English.

More of the upper than lower SES children had attended kindergarten or playschool. Further, for those children that had attended kindergarten or playschool, the upper SES children had done so for a significantly greater mean period of time than had the lower SES children.

The only other significant demographic differences found between the two SES half samples were on two of the

variables reflecting the mothers' residency. The mean number of years out of the preceding 10 during which the mother had been resident in Canada was significantly higher for lower compared to upper SES mothers. The mean number of years out of the preceding 10 during which the mother had been resident in an urban setting was significantly higher for upper than for lower SES mothers.

Phase One Mother Behaviors

The behaviors of the mothers during the mother-child interactions observed during phase one were scored and tabulated separately for each SES half sample. Summaries of these data are presented in Tables 6,7, and 8. The statistical significance of any differences between the SES half samples was tested using two-tailed t tests for non-correlated samples. For the same reasons as mentioned previously, considerations of homogeneity of variance and distributional normality were ignored. Also presented in Tables 6,7, and 8 are the scorer reliability coefficients for each of the raw scores. These coefficients were described in the previous chapter

The mean duration of the orientation period (Table 6) was significantly longer for upper than for lower SES mothers. The mean number of orientation period global rule statements which contained at least one attribute label

Table 6

Mother Behaviors for Phase One Orientation Period

		Reliab. Coeff.	LoSES	HiSES	
1. Duration in seconds	Mean @	.98	21.07 (25.21)	32.15 (31.83)	*
	Median		16.33 (219)	21.75 (177)	
2. Concept presentation Size:	Mean	.83	.99 (.67)	1.12 (.84)	ns
Number scoring	0		16	19	
	1		45	31	
	2		13	22	
	3		1	3	
Color:	Mean	1.00	1.00 (.66)	1.03 (.82)	ns
Number scoring	0		15	21	
	1		46	34	
	2		13	17	
	3		1	3	
3. Mean number of Global Rule Statements (GRS) made		.69	1.32 (.77)	1.42 (.68)	ns
4. Number of mothers making at least one GRS			65	72	
5. Mean number GRSs containing at least one attribute label		.94	.95 (.71)	.69 (.62)	*
6. Number of mothers making at least one of these labeled GRSs			56	46	
7. Mean proportion GRSs containing at least one attribute label			.68 (.43)	.52 (.45)	*

ns not significant; * significant beyond the .05 level.
@ For the means, figure in parentheses is the standard deviation; for the median, it is the range.

was significantly higher for the lower than for the upper SES mothers. Also, the mean proportion of orientation period global rule statements which contained at least one attribute label was significantly higher for the lower than for the upper SES mothers. None of the other orientation period variables produced any significant SES differences

Of the various pre-response measures taken (Table 7), only three yielded significant SES differences. The mean proportion of pre-response utterances which contained at least one attribute label was significantly higher for the lower than for the upper SES mothers. The mean proportion of pre-response utterances that were also classifiable as global rule statements was significantly higher for the upper than for the lower SES mothers. And finally, the mean proportion of these pre-response utterances-cum-global rule statements which contained at least one attribute label was significantly higher for the lower than for the upper SES mothers.

The post-response measures (Table 8) yielded only one significant SES difference. The mean number of post correct response utterances that were supplemented by focusing was significantly higher for the upper than for the lower SES mothers.

Table 7

Mother Behaviors for Phase One Pre-response Category

	Reliab. Coeff.	LoSES	HiSES	
1. Mean number of Pre-response Utterances (PRU) made	.93	5.16 (3.17)	4.35 (4.74)	ns
2. Mean number of PRUs containing both attribute labels	.86	1.09 (1.52)	.77 (1.22)	ns
3. Mean proportion PRUs containing both attribute labels		.21 (.28)	.16 (.25)	ns
4. Number mothers making at least one PRU containing both attribute labels		38	29	
5. Mean number of PRUs containing at least one attribute label	.94	2.55 (1.95)	1.85 (2.84)	ns
6. Mean proportion PRUs containing at least one attribute label		.48 (.29)	.32 (.36)	**
7. Number mothers making at least one PRU containing at least one attribute label		66	40	
8. Mean number of PRUs supplemented by focusing	.97	.19 (.51)	.53 (1.80)	ns
9. Mean proportion PRUs supplemented by focusing		.03 (.07)	.06 (.14)	ns
10. Number mothers making at least one PRU supplemented by focusing		11	17	

Table 7 continued on next page.

Table 7 (Continued)

	Reliab. Coeff.	LoSES	HiSES	
11. Mean number PRUs also classifiable as GRSs	.74	1.37 (1.19)	1.55 (1.38)	ns
12. Mean proportion PRUs also classifiable as GRSs		.28 (.25)	.42 (.35)	**
13. Number mothers making at least one PRU-cum-GRS		54	55	
14. Mean number PRUs-cum-GRSs containing at least one attribute label	.91	.95 (.91)	.80 (1.13)	ns
15. Mean proportion PRUs-cum-GRSs containing at least one attribute label		.54 (.46)	.37 (.45)	*
16. Number mothers making at least one PRU-cum-GRS containing at least one attribute label		47	34	

ns not significant.
* significant beyond the .05 level.
** significant beyond the .01 level.

Note: For means, the figure in parentheses is the standard deviation.

Table 8

Mother Behaviors for Phase One Post-response Category

	Reliab. Coeff.	LoSES	HiSES	
1. Mean number of Post Correct Response Utterances (PCRU) made	.93	4.76 (2.64)	4.88 (2.63)	ns
2. Mean number of PCRUs containing at least one attribute label	.71	.35 (.60)	.47 (.87)	ns
3. Mean proportion PCRUs containing at least one attribute label		.07 (.12)	.09 (.16)	ns
4. Number mothers making at least one PCRU containing at least one attribute label		22	21	
5. Mean number PCRUs supplemented by focusing	.69	.05 (.28)	.15 (.54)	*
6. Mean proportion PCRUs supplemented by focusing		.02 (.12)	.02 (.08)	ns
7. Number mothers making at least one PCRU supplemented by focusing		3	8	
8. Mean number PCRUs also classifiable as GRSs	.23	.20 (.44)	.25 (.55)	ns
9. Mean proportion PCRUs also classifiable as GRSs		.05 (.11)	.05 (.11)	ns
10. Number mothers making at least one PCRU-cum-GRS		14	16	
11. Mean number of Post Incorrect Response Utterances (PIRU) made	.91	1.04 (1.44)	.88 (1.49)	ns

Table 8 continued on next page.

Table 8 (Continued)

	Reliab. Coeff.	LoSES	HiSES	
12. Mean number of PIRUs containing at least one attribute label	.83	.53 (.72)	.41 (.79)	ns
13. Mean proportion PIRUs containing at least one attribute label		.32 (.42)	.23 (.41)	ns
14. Number mothers making at least one PIRU containing at least one attribute label		31	21	
15. Mean number PIRUs supplemented by focusing	.50	.24 (.52)	.29 (.85)	ns
16. Mean proportion PIRUs supplemented by focusing		.14 (.32)	.12 (.30)	ns
17. Number mothers making at least one PIRU supplemented by focusing		15	12	
18. Mean number of PIRUs also classifiable as GRSs	.60	.44 (.81)	.25 (.50)	ns
19. Mean proportion PIRUs also classifiable as GRSs		.23 (.38)	.17 (.35)	ns
20. Number mothers making at least one PIRU-cum-GRS		22	17	
21. Mean CMVS		28.04	31.90	ns

* significant beyond the .001 level; ns not significant beyond at least the .05 level.

Note: For the means, the figure in parentheses is the standard deviation.

Phase One Child Behaviors

The behaviors of the children in the phase one mother-child interactions were also scored and tabulated separately for the upper and lower SES half samples. These data are summarized in Tables 9 and 10. The SES differences were tested for statistical significance using two-tailed t tests for non-correlated samples. Considerations of homogeneity of variance and distributional normality were ignored for reasons outlined previously. The scorer reliability coefficients for the various child behavior raw scores are also reproduced in Tables 9 and 10.

For the child behaviors that occurred during the orientation period (Table 9), all but two of the variables yielded significant SES differences. The mean number of questions or utterances made, the mean number of questions or utterances that related to the sorting attributes, the mean proportion of questions or utterances that related to the sorting attributes, the mean number of questions or utterances that involved the use of an attribute label, and the mean proportion of questions or utterances that involved the use of an attribute label were each significantly higher for the upper than for the lower SES children.

The child behaviors occurring during the sorting

Table 9

Child Behaviors for Phase One Orientation Period

	Reliab. Coeff.	LoSES	HiSES	
1. Mean number of questions or utterances made by child	.74	.80 (1.04)	1.33 (1.83)	*
2. Number children making at least one question or utterance (QU)		40	45	
3. Mean number QUs relating to attributes	.95	.15 (.63)	.64 (1.27)	**
4. Mean proportion QUs relating to attributes		.08 (.25)	.24 (.39)	**
5. Number children making at least one QU relating to attributes		7	24	
6. Mean number QUs relating to GRSs	.78	.32 (.62)	.35 (.67)	ns
7. Mean proportion QUs relating to GRSs		.22 (.41)	.19 (.35)	ns
8. Number children making at least one QU relating to GRSs		18	20	
9. Mean number QUs involving use of at least one attribute label	.92	.20 (.66)	.64 (1.11)	**
10. Mean proportion QUs involving use of at least one attribute label		.12 (.30)	.26 (.40)	*
11. Number children making at least one QU involving use of at least one attribute label		11	25	

ns not significant; * significant beyond the .05 level;
** significant beyond the .01 level.

Note: Figure in parentheses is standard deviation.

responses (Table 10) yielded only three significant SES differences. The mean number of sorting responses that were preceded by a mother utterance, the mean proportion of sorting responses that were preceded by a mother utterance, and the mean number of these preceded responses that were correct according to the intent of the mother utterance were each significantly higher for the lower than for the upper SES children.

Preliminary to Phase Two Analyses

The four basic experimental groups for phase two were compared with respect to their mean CMVSs (see Table 3). Using two-tailed t tests for non-correlated samples, the mean CMVS for the HiSES-HiV group was found to be significantly (beyond the .001 level) greater than that for the LoSES-HiV group. In contrast to this finding, no significant CMVS difference was found between the HiSES-LoV and LoSES-LoV groups. Consequently, SES and high versus low mother CMVS ranking could not be used as independent factors in the analysis of the phase two data. The four groups were thus combined into one four level factor for analysis purposes.

The two major dependent variables used in phase two were trials-to-criterion (TTC) and elapsed-time-to-criterion (ETTC). From Table 11 it can be seen that for

Table 10

Child Behaviors for Phase One Sorting Responses Category

	Reliab. Coeff.	LoSES	HiSES	
1. Mean number of sorting responses made	.91	14.91 (5.39)	16.16 (8.33)	ns
2. Mean number sorting responses correct	.97	12.85 (3.72)	14.09 (4.53)	ns
3. Mean proportion sorting responses correct		.89 (.14)	.92 (.12)	ns
4. Mean proportion correct sorting responses given feedback from mother		.38 (.19)	.36 (.19)	ns
5. Mean number sorting responses incorrect	.87	2.05 (2.87)	2.07 (4.94)	ns
6. Mean proportion sorting responses incorrect		.11 (.14)	.08 (.12)	ns
7. Mean proportion incorrect sorting responses given feedback from mother		.35 (.41)	.29 (.40)	ns
8. Mean number of sorting responses that were preceded by a mother utterance	.90	4.00 (2.24)	3.19 (2.49)	*
9. Mean proportion sorting responses that were preceded by a mother utterance		.28 (.14)	.20 (.12)	**
10. Mean number of preceded sorting responses correct according to intent of the mother utterance	.74	3.49 (1.78)	2.75 (1.77)	*
11. Mean proportion preceded sorting responses correct according to intent of the mother utterance		.88 (.21)	.89 (.23)	ns

Table 10 continued on next page.

Table 10 (Continued)

	Reliab. Coeff.	LoSES	HiSES	
12. Mean number of preceded sorting responses incorrect according to intent of the mother utterance	.90	.51 (.94)	.44 (1.04)	ns
13. Mean proportion preceded sorting responses incorrect according to intent of the mother utterance		.12 (.21)	.08 (.18)	ns
14. Mean number questions or utterances (QU) made by child	.88	2.84 (2.45)	2.88 (3.02)	ns
15. Number children making at least one QU		65	54	
16. Mean number QUs relating to attributes	.52	.51 (.92)	.71 (1.42)	ns
17. Mean proportion QUs relating to attributes		.13 (.24)	.16 (.29)	ns
18. Number children making at least one QU relating to attributes		23	23	
19. Mean number QUs relating to GRSs	.67	1.07 (1.31)	1.25 (1.53)	ns
20. Mean proportion QUs relating to GRSs		.33 (.36)	.35 (.38)	ns
21. Number children making at least one QU relating to GRSs		42	42	
22. Mean number QUs involving use of at least one attribute label	.96	.93 (1.32)	1.04 (1.59)	ns

Table 10 continued on next page.

Table 10 (Continued)

	Reliab. Coeff.	LoSES	HiSES	
23. Mean proportion QUs involving use of at least one attribute label		.23 (.31)	.24 (.33)	ns
24. Number children making at least one QU involving use of at least one attribute label		32	33	

ns not significant.
* significant beyond the .05 level.
** significant beyond the .001 level.

Note: Figure in parentheses is the standard deviation.

Table 11

Phase Two Dependent Variable Interrelatedness

		Correlation TTC versus ETTC
Task 1	Pre-shift	.93
	Post-shift	.93
Task 2	Pre-shift	.97
	Post-shift	.94

each section of phase two these two dependent variables were very highly interrelated. Consequently, since the findings were identical in each instance where duplicate analyses were conducted, only the TTC analyses will be reported.

Phase Two Pre-shift Learning

The first analysis performed on the phase two data was a 4x2x2 fixed effects repeated measures analysis of variance. The respective factors in this analysis were SES-verbal (the four basic experimental groups), training-control (refering to the sequence between tasks one and two), and tasks one and two (the repeated factor). The dependent variables used were the TTCs from the pre-shift sections of tasks one and two. With 128 subjects in phase two, the cell size for this analysis was 16 subjects.

A summary of this analysis is presented in Table 12. The significance of each of the F values was tested using the Geisser and Greenhouse procedure (Winer, 1962) in order to avoid assumptions regarding the equality of covariances in the variance-covariance matrix. The significant training-control main effect indicated that the mean TTC pooled over tasks was significantly lower for the 64 training subjects (48.44) than for the 64 control subjects (70.31). The significant tasks main effect

Table 12

Summary of Three-way Repeated Measures Analysis of Variance on Pre-shift TTCs

Source	df	MS	F
A (SES-verbal)	3	6648.75	1.50
B (Trg-Con)	1	30581.25	6.90 **
AxB	3	5069.50	1.14
Subj. w. grps.	120	4433.22	
C (Tasks)	1	247133.00	47.74 ***
AxC	3	1684.25	.33
BxC	1	27555.75	5.32 *
AxBxC	3	6105.75	1.18
CxSubj. w. grps.	120	5176.42	

* significant beyond the .05 level.
** significant beyond the .01 level.
*** significant beyond the .001 level.

indicated that for all 128 subjects the mean TTC on the pre-shift section of task two (28.31) was significantly lower than that for the pre-shift section of task one (90.45).

The significant training-control versus tasks interaction was investigated further using a Newman-Keuls procedure (see Table 13). This interaction is graphed in Figure 8. From these Newman-Keuls tests it was seen that the interaction was basically only reflecting the significant tasks main effect in that each of the task one TTC means was significantly greater than each of those for task two. However, the task one mean TTC for the control subjects was also found to be significantly greater than that for the training subjects; a seemingly incongruous finding since task one was temporally prior to the administration of the training-control condition.

To clarify this unusual difference frequency polygons were drawn, for control and training subjects separately, showing the numbers of subjects that were administered phase two for each of the 14 days used alltold. As can be seen from Figure 9, a large proportion of the control subjects were administered phase two in the first few days, whereas none of the training subjects were run until day eight (the reasons for this variation in phase two administration related to the availability of the extra materials and assistants needed for the presentation of

Table 13

Summary of Newman-Keuls Tests on the Training-Control versus Tasks Interaction from the Pre-shift Learning Analysis of Variance.

Table of Between-group Mean TTC Differences.

	1 Task 2 -Trg	2 Task 2 -Con	3 Task 1 -Trg	4 Task 1 -Con		Crit diff	Crit diff
	27.75*	28.86	69.14	111.75	r	(.05)	(.01)
1	0	1.11	41.39**	84.00**	4	33.17	40.45
2		0	40.28**	82.89**	3	30,31	37.76
3			0	42.61**	2	25.17	33.26

** significant beyond the .01 level.

* Mean TTC for the respective Tasks versus Training-Control groups.

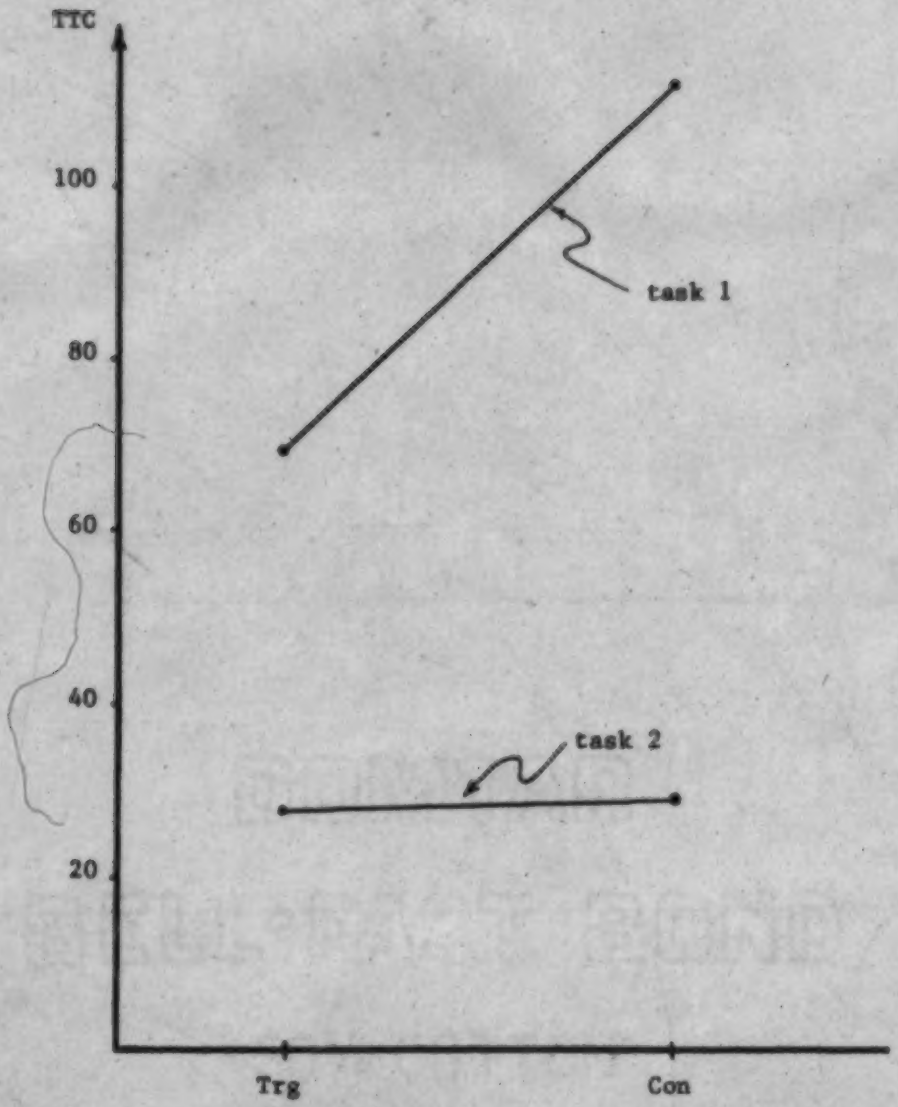


Fig. 8. TTC means for the training-control versus tasks interaction from the pre-shift learning analysis of variance.

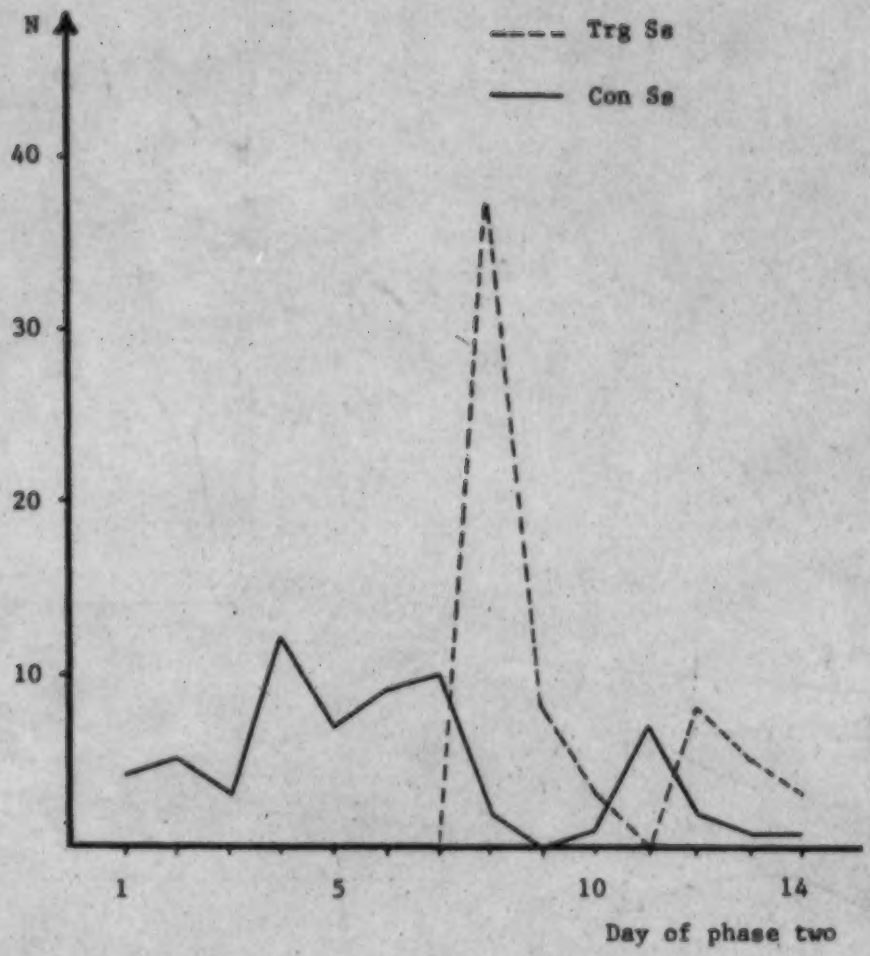


Fig. 9. Frequency polygons for days of phase two administration versus training-control.

the training condition). In the previous chapter it was argued that the preliminary tutoring given by the experimenter and his assistants may have been partially inadequate for those subjects administered phase two early (see Table 4). Since these early subjects would have been entirely control subjects, it would appear that the significant task one training versus control difference found here may have been merely reflecting this initial tutoring inadequacy. Further, since there were no significant differences found between training and control subjects on task two, it would seem that the significant training-control main effect found here might also have been only reflecting this possible tutoring inadequacy. Thus, in summary, it would appear that the only veridical finding in the above analysis of variance was the significant tasks main effect.

Although the analysis of variance just described indicated that there were no significant SES differences on the final overall pre-shift task performances, the possibility remained that there may have been differences during task performance. To assess this possibility backward learning curves were plotted for each of the four basic SES-verbal groups on task one pre-shift performance, and for each of these same four groups but split into training and control subjects for task two pre-shift performance. The last 100 trials were used in each case.

These backward learning curves are reproduced in Figures 10 and 11. The ordinate in each graph is the mean number of correct trials in a five trial trial-block. The abscissa is the number of the trial-block, numbering backwards, the last trial-block being numbered one. Note that since the TTC varied greatly from subject to subject, the number of subjects actually used in calculating any one trial-block mean was higher the closer that trial-block was to criterion. Also, in the calculation of any one trial-block mean only subjects having complete trial-blocks were used.

From the graphs in Figures 10 and 11 it can be seen that there were no obvious learning curve differences between the SES-verbal groups on the task one pre-shift learning, nor between the SES-verbal training versus control half groups on the task two pre-shift learning. In each case, the curve fluctuated around the chance level of 2.5 correct trials per trial-block, rising to asymptote only for the last two trial-blocks which of course constituted the criterion.

The four basic SES-verbal groups were also compared with each other with respect to the mean latencies for each of the last 10 five trial trial-blocks in the task one pre-shift learning. The differences were tested for statistical significance using two-tailed t tests for non-correlated samples. The only significant finding was that

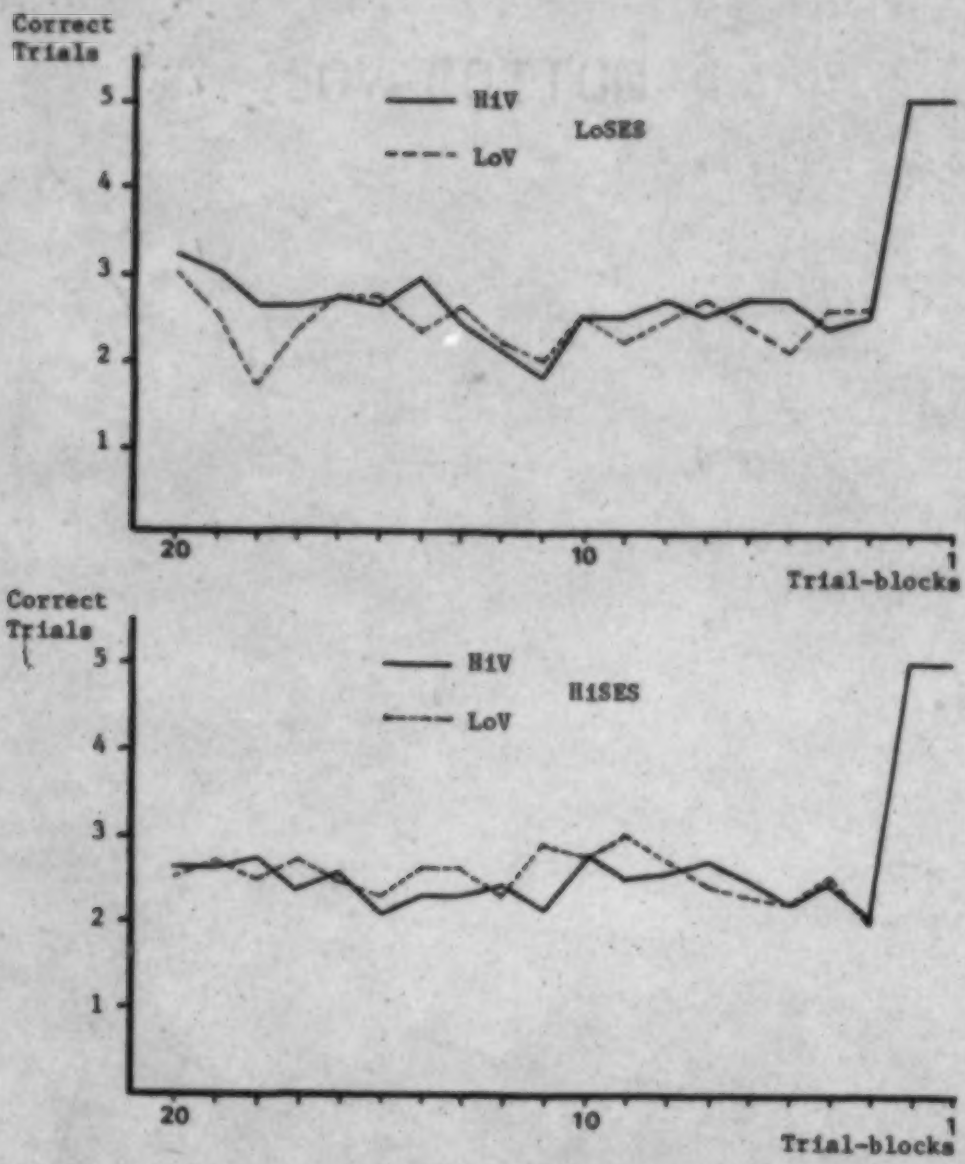


Fig. 10. Task one pre-shift learning curves, mean correct trials per trial-block versus trial-block.

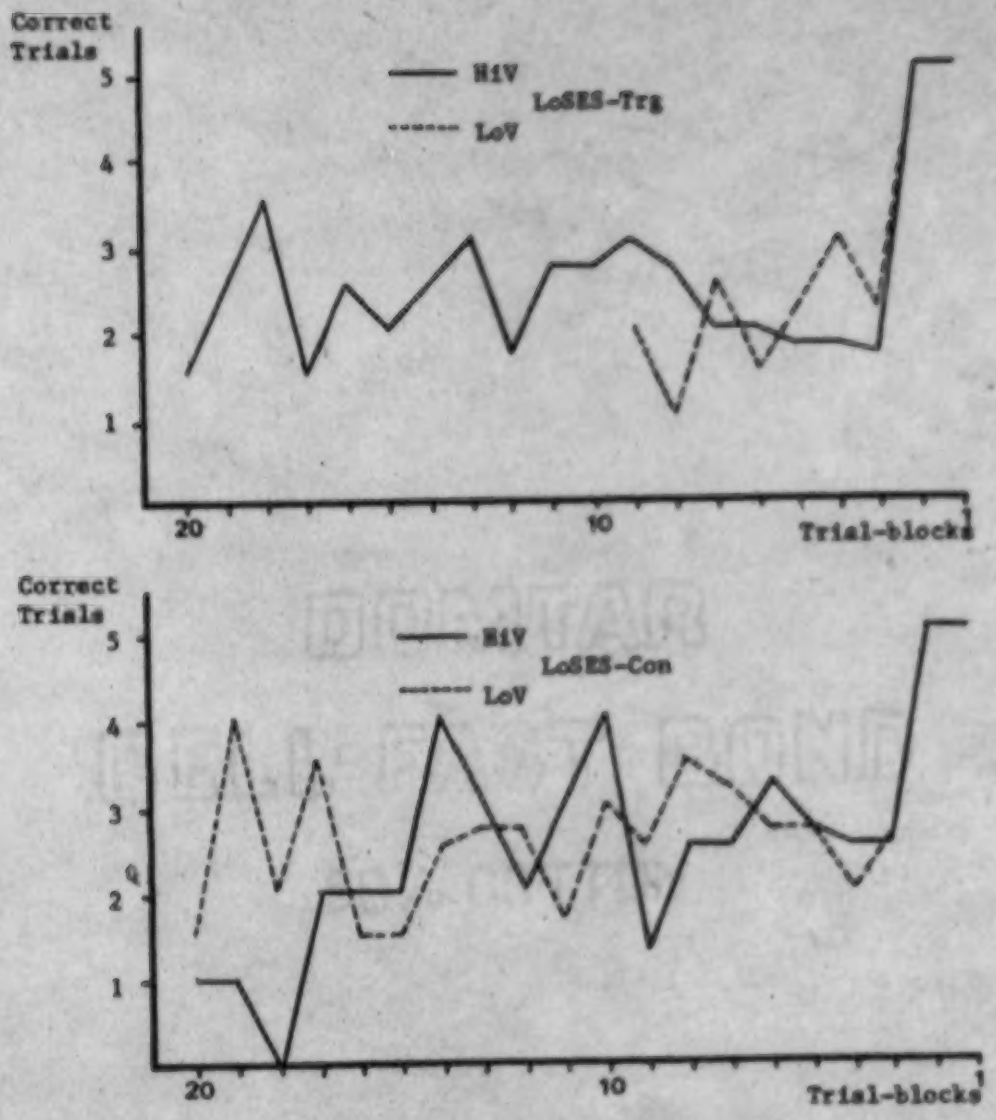


Fig. 11. Task two pre-shift learning curves, mean correct trials per trial-block versus trial-block.

(Fig. 11. continued overleaf.)

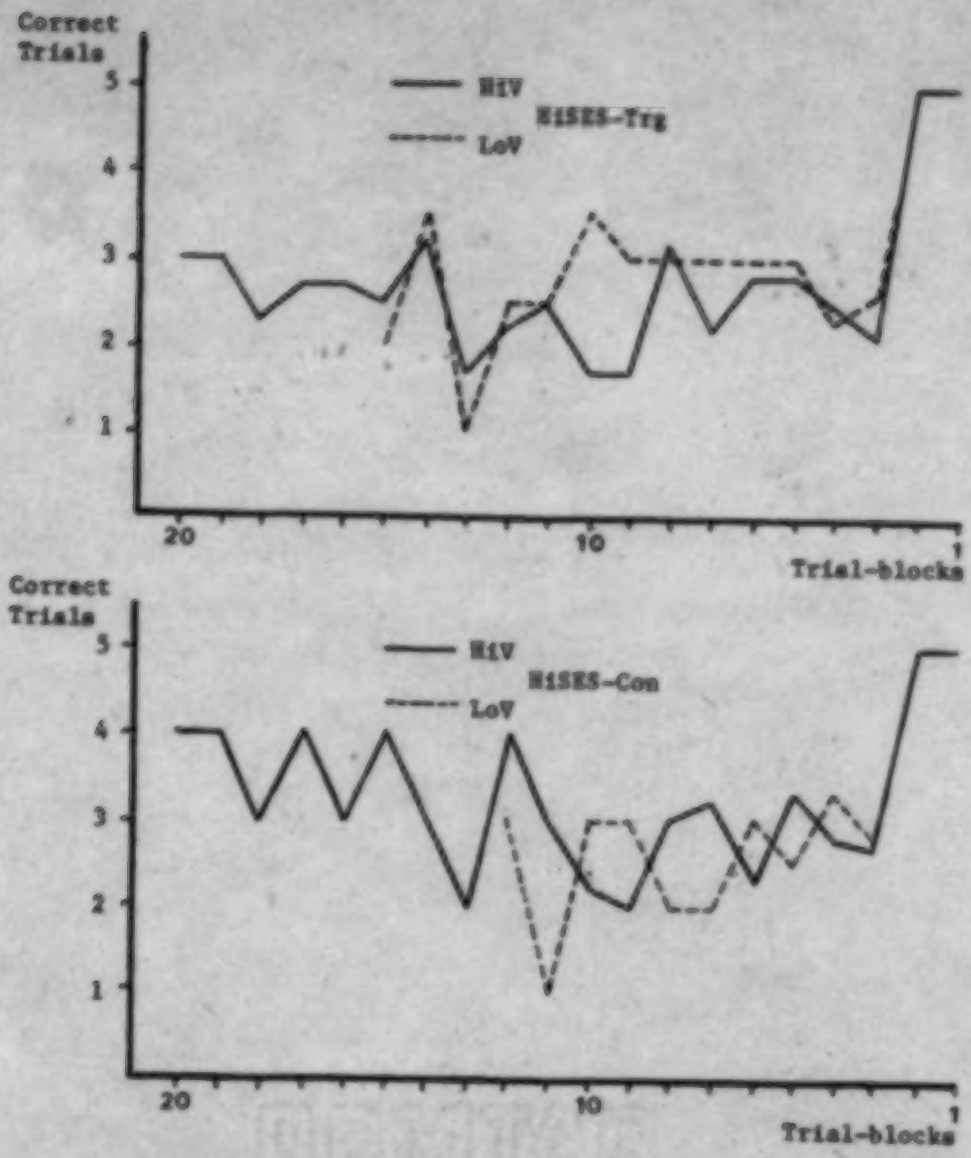


Fig. 11. (Continued.)

on trial-block three (ie. that just preceding the last two criterion trial-blocks). The mean response latency for the HiSES-HiV group was significantly greater than those for each of the other three groups. These latency comparisons are summarized in Table 14.

A similar procedure to that above was also used to test the mean latencies over the last five trial-blocks in the task two pre-shift learning. None of the differences between the eight SES-verbal, training-control, half groups were statistically significant (see Table 15).

Phase Two Post-shift Learning

Task One

The performances on the post-shift section of task one were analyzed using a 4x2 fixed effects analysis of variance using TTC as the dependant variable. The factors in this analysis were the four basic SES-verbal groups and the type of shift (ID versus ED) respectively. The cell size in this analysis was 16 subjects. Since the cells were all of equal size, considerations of homogeneity of variance were ignored. A summary of the analysis is given in Table 16.

The only significant finding from this analysis was the ID-ED main effect. The mean TTC for the 64 subjects under the ID task one post-shift condition (32.98) was

Table 14

Mean Trial-block Latencies in Seconds for Task One

Pre-shift Learning

Trial block	LoSES-HiV	LoSES-LoV	HiSES-HiV	HiSES-LoV
10	12.94 (16.85, 13)*	6.76 (4.52, 20)	8.53 (10.59, 16)	9.24 (8.62, 17)
9	8.78 (7.16, 19)	8.32 (6.66, 21)	12.07 (13.54, 21)	6.61 (2.83, 18)
8	10.82 (15.26, 19)	7.41 (6.64, 21)	10.16 (10.42, 22)	6.86 (3.33, 18)
7	7.07 (5.80, 21)	8.83 (8.62, 22)	11.87 (12.04, 23)	6.98 (4.93, 19)
6	9.26 (11.36, 23)	10.25 (7.90, 25)	11.62 (11.24, 23)	7.60 (5.84, 20)
5	8.73 (7.02, 27)	10.80 (9.46, 26)	12.77 (10.04, 25)	8.32 (7.31, 22)
4	10.95 (8.42, 27)	9.24 (6.02, 27)	9.83 (6.29, 25)	9.65 (5.11, 25)
3	10.72 (7.52, 30)	8.61 (4.76, 28)	16.62** (9.82, 29)	10.86 (7.14, 27)
2	8.27 (4.86, 32)	9.47 (7.89, 32)	9.77 (6.45, 32)	7.47 (3.25, 32)
1	4.55 (2.38, 32)	5.07 (2.53, 32)	5.21 (4.26, 32)	4.69 (4.48, 32)

* Figures in parentheses are, respectively, the standard deviation and the number of subjects involved in the calculation of the mean.

** For trial-block 3, HiSES-HiV significantly greater than LoSES-LoV (.001), LoSES-HiV (.05), and HiSES-LoV (.05).

Table 15

Mean Trial-block Latencies in Seconds for Task Two

Pre-shift Learning

Trial block	LoSES-HiV	LoSES-LoV	HiSES-HiV	HiSES-LoV
5 Trg Ss	3.80 (1.98, 5)*	8.36 (4.35, 5)	5.02 (3.65, 5)	4.20 (1.70, 2)
Con Ss	5.65 (1.98, 4)	5.32 (3.99, 4)	8.50 (3.74, 6)	7.35 (1.91, 2)
4 Trg Ss	5.54 (3.71, 5)	13.26 (7.48, 5)	9.78 (5.55, 9)	9.23 (9.32, 3)
Con Ss	6.40 (.95, 6)	5.00 (2.89, 5)	13.13 (15.38, 7)	6.90 (2.88, 3)
3 Trg Ss	7.00 (6.27, 7)	8.82 (5.38, 8)	8.61 (6.35, 12)	6.48 (3.40, 5)
Con Ss	6.32 (3.38, 8)	13.50 (12.36, 5)	10.14 (9.48, 10)	5.28 (3.57, 6)
2 Trg Ss	4.36 (1.82, 16)	6.62 (5.47, 16)	6.78 (5.03, 16)	4.41 (1.60, 16)
Con Ss	5.02 (2.38, 16)	6.41 (4.42, 16)	5.27 (3.32, 16)	4.72 (2.24, 16)
1 Trg Ss	3.21 (.99, 16)	4.73 (3.32, 16)	4.01 (1.61, 16)	3.38 (1.68, 16)
Con Ss	3.92 (1.72, 16)	3.61 (1.67, 16)	4.56 (3.56, 16)	3.46 (1.41, 16)

* Figures in parentheses are, respectively, the standard deviation and the number of subjects involved in the calculation of the mean.

Table 16

Summary of Two-way Analysis of Variance on Task One Post-shift TTC

Source	df	MS	F
A (SES-verbal)	3	4968.93	2.26
B (ID-ED)	1	20706.12	9.41 *
AxB	3	2702.85	1.23
Error	120	2199.40	

* significant beyond the .01 level.

significantly lower than that for the 64 subjects under the ED task one post-shift condition (58.42).

A SES-verbal x ID-ED x Pre- to Post-shift repeated measures analysis of variance was not conducted on the task one data because of the previously noted confounding relationship between the date of phase two's administration and the task one pre-shift performance. It was felt that this confounding relationship would only give rise to confusing and uninterpretable findings, thus negating any benefits that may have come from performing such a repeated measures analysis. Further, since first, the correlation between the task one post-shift TTC and the date of phase two's administration was effectively zero (see Table 4), and since second, the underlying finding argued for the task one pre-shift TTC performances was one of no significant differences, it seemed highly unlikely that there would have been any significant interactive relationship between pre- and post-shift performances.

Nevertheless it was considered fruitful to at least partially check this improbable possibility by conducting a SES-verbal x ID-ED analysis of covariance on the task one post-shift TTC, using the task one pre-shift TTC as the covariate. From Table 17 it can be seen that the findings from this analysis exactly paralleled those from the above analysis of variance. The adjusted TTC means for

Table 17

Summary of Two-way Analysis of Covariance on Task One Post-shift TTC, using Task One Pre-shift TTC as Covariate

Source	df	MS	F
A (SES-verbal)	3	4514.56	2.05
B (ID-ED)	1	21615.12	9.82 *
AxB	3	2407.00	1.09
Error	119	2204.76	

* significant beyond the .01 level.

the ID and ED subjects were 32.65 and 58.76 respectively, both negligibly different from the actual means. Thus, it seems that the conclusion argued above that the task one post-shift performance was independent of this confounding administration date effect was justified.

Task Two

The performances on the post-shift section of task two were analyzed using a 4x2x2x2 repeated measures fixed effects analysis of variance using TTC as the dependent variable. The factors in this analysis were the four basic SES-verbal groups, the training-control condition, the ID-ED shift type, and the pre- to post-shift learning (the repeated factor), respectively. The cell size in this analysis was eight subjects. A summary of the analysis is given in Table 18. The statistical significance of each of the F values was tested using the Geisser and Greenhouse procedure (Winer, 1962) for the same reasons as noted previously.

The ID-ED main effect was found to be significant, indicating that the mean TTC pooled over pre- and post-shift sections was significantly smaller for the 64 ID subjects (22.08) than for the 64 ED subjects (35.09). Also, the ID-ED versus pre- to post-shift interaction was found to be significant. This interaction is graphed in Figure 12.

Table 18

Summary of Four-way Repeated Measures Analysis of Variance on Pre- and Post-shift Task Two TTC

Source	df	MS	F
A (SES-verbal)	3	2540.81	1.84
B (Trg-Con)	1	40.64	.03
C (ID-ED)	1	10842.02	7.86 **
AxB	3	814.22	.59
AxC	3	404.02	.29
BxC	1	346.89	.25
AxBxC	3	568.68	.41
Subj. w. grps.	112	1379.80	
D (Pre- to Post-shift)	1	20.25	.02
AxD	3	746.04	.90
BxD	1	232.56	.28
CxD	1	4970.25	6.00 *
AxBxD	3	413.40	.50
AxCxD	3	779.71	.94
BxCxD	1	36.00	.04
AxBxCxD	3	401.62	.48
DxSubj. w. grps.	112	828.77	

* significant beyond the .05 level.
** significant beyond the .01 level.

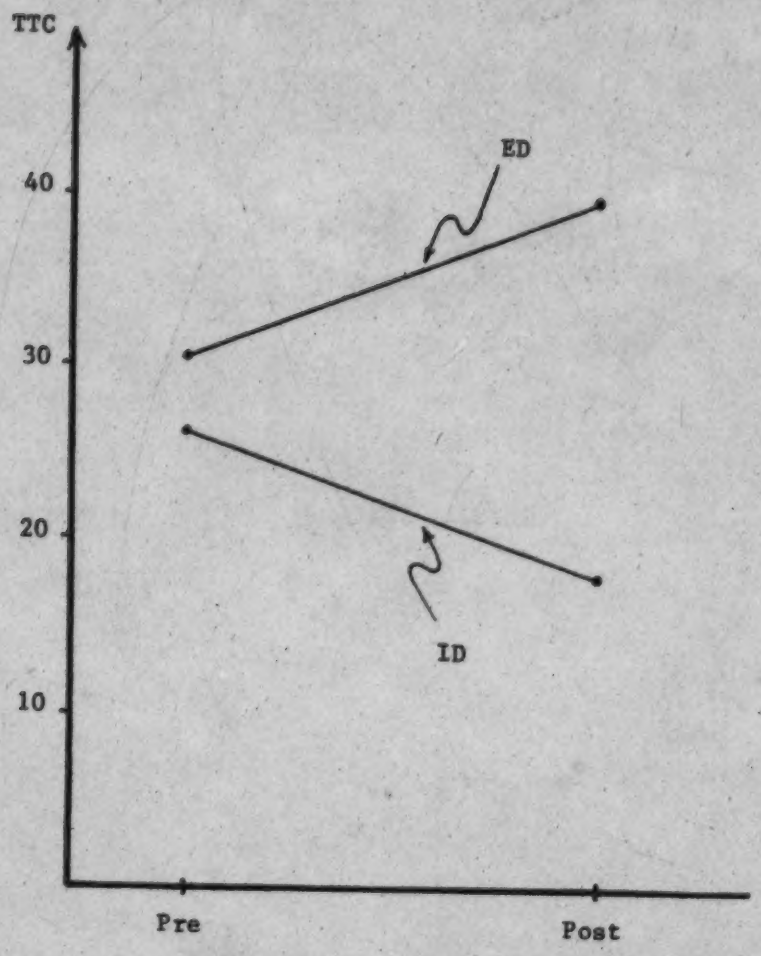


Fig. 12. Task two pre- and post-shift TTC means, graphed separately for ID and ED subjects.

In order to clarify and interpret this interaction, Newman-Keuls tests were performed on the differences between the respective group means. These tests are summarized in Table 19. The findings were that the post-shift mean TTC for the ID subjects was significantly lower than that for the ED subjects, that the post-shift mean TTC for the ED subjects was significantly greater than the pre-shift mean TTC for the ID subjects, and that the post-shift mean TTC for the ID subjects was significantly lower than the pre-shift mean TTC for the ED subjects. None of the other differences were significant.

Thus it would seem that the best interpretation of this interaction is that there were no pre-shift TTC differences, but that following the shift the ED subjects suffered a relative TTC increase while the TTC for the ID subjects showed a relative decrease. Also, since there were no significant pre-shift differences, it would seem that these post-shift ID-ED differences were the source of the significant ID-ED main effect reported above.

Miscellaneous Further Analyses

It was decided, due to the relatively large variances in the task one pre-shift learning, that there may have been some interactive relationship between the task one pre- and post-shift performances, independent of SES-

Table 19

Summary of Newman-Keuls Tests on the ID-ED versus Pre- to Post-shift Interaction from the Task Two Repeated Measures Analysis of Variance.

Table of Between-group Mean TTC Differences

	1	2	3	4			
	ID-Post	ID-Pre	ED-Pre	ED-Post		Crit diff	Crit diff
	17.95@	26.20	30.41	39.78	r	(.05)	(.01)
1	0	8.25	12.46*	21.83**	4	12.9	16.2
2		0	4.21	13.58*	3	12.1	15.1
3			0	9.37	2	10.1	13.3

* significant beyond the .05 level.
** significant beyond the .01 level.

@ Mean TTC for the respective ID-ED versus Pre- to Post-shift cells.

verbal grouping. This possibility was tested using a 2x2 fixed effects analysis of variance on post-shift TTC, with the factors being high versus low (relative to the median) pre-shift TTC, and ID versus ED shift type, respectively. Due to the unplanned nature of this analysis, the cell sizes turned out to be unequal; 35 for the ID-low pre-shift TTC group, 29 for the ED-low pre-shift TTC group, 29 for the ID-high pre-shift TTC group, and 35 for the ED-high pre-shift TTC group.

The results of this analysis are summarized in Table 20. The only significant finding was the ID-ED main effect, indicating that the mean TTC for the 64 ID subjects was significantly lower than that for the 64 ED subjects, and paralleling the findings from the task one post-shift analysis of variance (see Table 16) previously described. There was no significant interactive relationship between shift type and pre-shift performance, nor was the pre-shift performance main effect significant. Thus no evidance was found for a possible interactive relationship between the task one pre- and post-shift performances.

A similar analysis to that above was also performed on the task two post-shift performances. The factors in this analysis were high versus low pre-shift TTC, training versus control, and ID versus ED shift type. The findings are summarized in Table 21. The lone significant finding

Table 20

Summary of Two-way Analysis of Variance on Task One Post-shift TTC; High versus Low Pre-shift TTC and ID versus ED being the Factors

Source	df	MS	F
A (Pre-shift TTC)	1	6885.19	3.11
B (ID-ED)	1	22813.80	10.31 *
AxB	1	5781.92	2.61
Error	124	2211.92	

* significant beyond the .01 level.

Table 21

Summary of Three-way Analysis of Variance on Task Two Post-shift TTC; High versus Low Pre-shift TTC, ID versus ED, and Training versus Control being the Factors

Source	df	MS	F
A (Pre-shift TTC)	1	6.88	.01
B (ID-ED)	1	15305.90	15.44 *
C (Trg-Con)	1	209.92	.21
AxB	1	1973.43	1.99
AxC	1	21.81	.02
BxC	1	18.72	.02
AxBxC	1	225.31	.23
Error	120	991.47	

* significant beyond the .001 level.

of the ID-ED main effect paralleled the findings from the task two analysis of variance (see Table 18) described previously. There was no evidence for any interactive relationships involving pre- and post-shift performances.

The final analyses to be run were two sets of correlations. In the first set, each of the eight dependent variables used in phase two (TTC and ETTC for the pre- and post-shift sections of tasks one and two) were correlated with each of the variables in the demographic information, and also with each of the phase one mother and child behavior variables. Of the 8x79 correlations that resulted, the correlation of greatest magnitude was +.34, there being only three correlations altogether that were of magnitude greater than .30. Since a correlation of .30 indicates that knowledge of the variance of one of the correlates allows for the statistical prediction of only 9% of the variance of the other correlate, it was concluded that none of the correlations in this analysis were of magnitudes effectively above zero as regards their interpretive importance.

In the second set of correlations, the CMVS variable from phase one was correlated with each of the variables in the demographic information. The correlations of highest magnitude from the 16 that resulted were +.14 and -.14. The conclusion reached regarding these correlations

was the same as that noted for those above, that none were of magnitudes effectively greater than zero as regards their interpretive importance.

CHAPTER SIX

Interpretation and Discussion

One of the major aims in this study was to select as subjects families from both extremes of the socioeconomic scale. From Table 1 in chapter four it can be seen that in terms of the Blishen indices used in determining SES, the upper and lower SES half samples were different. However, a range of one standard deviation either side of the mean index of 31.92 for the lower SES half sample represents occupations such as plumber, welder, shipping clerk, bus driver, motor mechanic, butcher, tailor, bricklayer, carpenter, and truckdriver. A similar range about the upper SES mean index of 70.49 represents occupations such as engineer, physician, professor, lawyer, teacher, accountant, and various categories of owners and managers. Thus, while the upper SES half sample was indeed respresentative of occupations at the upper end of the socioeconomic scale, the lower SES half sample was unfortunately representative of skilled workers rather than the unskilled labouring classes at the lower socioeconomic extreme.

The demographic comparisons described in the last chapter (see Table 5) further evidence this lack of SES extremeness in the two half samples. Both half samples

consisted of a majority of two child families (although this may have been due to the sampling requirement of using only eldest children in the study). Although statistically inferior to the mean educational level of the upper SES mothers, more than a third of the lower SES mothers had nevertheless completed high school. Further, more than two thirds of the lower SES child subjects had attended kindergarten or playschool, even though for a statistically significant lower mean period than had the upper SES child subjects.

Another point of interest relating to the demographic comparisons concerned the socioeconomic backgrounds of the subject families. For the lower SES half sample the mean SES indices for the paternal and maternal grandfathers were both essentially the same as that for the fathers themselves. However, for the upper SES half sample these grandfather mean indices were 47.04 and 45.78; representative of occupations such as photographer, locomotive engineer, telephone lineman, and various categories of foreman. Together with the relatively large standard deviations of 14.09 and 13.24 for these upper SES mean indices, these findings would seem to indicate that many of the families in the upper SES half sample were only recently upper SES.

Thus, in summary, the two half samples used in this study were likely not representative of extremes in

social, economic, familial, and intellectual factors. Regrettable though it was, this situation was probably unavoidable. At the time that data were being collected, Edmonton had a population of less than one half million. Consequently, the number of families having both parents tertiary educated and the father in a professional or managerial occupation, and the number of families having both parents educated at or below grade nine and the father in an unskilled labouring occupation, would both have been very small. Furthermore, Edmonton as a city had experienced very rapid growth in the last 20 years. Thus the proportion of upper SES families that were only first generation upper SES would have been relatively high compared to other centres across Canada. As a result, it would probably have been impossible to select a suitable 150 family sample that ideally fitted the socioeconomic extremes desired.

Discussion of General Hypothesis 1

The first general hypothesis related to the behaviors of the mothers observed during the phase one dyad interaction. This hypothesis predicted that upper SES mothers would be more directive and giving of information than would lower SES mothers. Eight specific hypotheses were derived from this first general hypothesis; three

related to the orientation period, three to the pre-response category, and two to the post-response category.

Specific Hypotheses Relating to Orientation Period

Specific hypothesis H11 predicted that upper SES mothers would spend significantly more time in the preliminary orientation period than would lower SES mothers. From item one in Table 6 it can be seen that H11 was supported.

The prediction of H12 was that upper SES mothers would more extensively provide their children with attribute labels than would lower SES mothers. Overall, the data on this prediction were inconclusive. For both size and color concept presentation scores (see item 2, Table 6), more lower than upper SES mothers scored at or above "1". Further, lower SES mothers were significantly greater than upper SES with respect to both the number and the proportion of global rule statements (GRS) made which contained at least one attribute label (see items 5 and 7, Table 6). However, there were no significant differences between the SES half samples with respect to either of the concept presentation score means. Thus, although still inconclusive, it would seem that if anything the data regarding H12 supported a tendency opposite to that predicted, and contrary to the findings of the relevant studies reviewed earlier (eg. Bee, vanEgeren, Streissguth,

Nyman & Leckie, 1969).

This inconclusiveness may be at least partially explained by the behaviors of the children during the orientation period. From Table 9 it can be seen that as well as asking or making more questions or utterances (QU) overall, the upper SES children were also significantly more frequent than the lower SES with respect to QUs specifically relating to the sorting attributes. Further, more of the upper SES children's QUs actually involved the use of an attribute label than did those of the lower SES. Thus it would seem that the upper SES mothers may have been less frequent than the lower SES mothers in the provision of attribute labels simply because they often did not need to do so; the upper SES children were already using the relevant labels without any prompting. Note that such an explanation would also fit the finding regarding orientation duration in that something must have been occurring during the longer durations exhibited by the upper SES mothers.

Specific hypothesis H13 predicted that upper SES mothers would more frequently focus their children's attention on the sorting attributes during the orientation period than would lower SES mothers. This hypothesis was only partially supported. For both concept presentation scores, more upper than lower SES mothers scored at "2" or above. However, the lack of significant SES differences in

the presentation score means disallowed any conclusive decision regarding H13.

In summary, it would appear that at least with respect to the orientation period the rationale underlying the first general hypothesis was partially yet inconclusively supported. Upper SES mothers did spend more time than lower SES in preliminary explanation. More upper than lower SES mothers exhibited focusing behaviors. And more upper than lower SES mothers exhibited instances of GRSs, although the SES difference in the mean number of GRSs made was not significant. Also, the evidence seemed to indicate that the apparently contrary finding regarding the mother's provision of attribute labels may have resulted from an already existing label fluency on the part of the upper SES children.

Specific Hypotheses Relating to Pre-response Category

Hypothesis H14 predicted that immediately prior to specific sorting responses upper SES mothers would provide attribute labels to their children proportionately more frequently than would lower SES mothers. This hypothesis was not supported (see Table 7). While there was no significant SES difference in the proportions of pre-response utterances (PRU) made by the mother which contained labels for both sorting attributes, the proportion of PRUs which contained at least one attribute

label was significantly greater for the lower rather than the upper SES mothers. Further, more lower than upper SES mothers were actually involved in the making of these labeled PRUs. Thus the data, if anything, supported a tendency opposite to that predicted by H14.

A possible explanation for this contrary finding would parallel that given for H12 above. If the upper SES children were already fluent in attribute labeling, then, as with the orientation period, the upper SES mothers may have been relatively infrequent in label provision through a simple lack of necessity. However, it should be noted that the only evidence for this label fluency explanation was that from the orientation period. None of the relevant child behavior variables from the sorting response category (see Table 10) showed any significant SES differences.

The prediction of H15 was that upper SES mothers would exhibit pre-response focusing more frequently than would lower SES mothers. From items 8, 9, and 10 in Table 7 it can be seen that H15 was only partially supported. There were no significant SES differences in either the mean number or the mean proportion of PRUs that were supplemented by focusing. The only supportive finding was that more upper than lower SES mothers actually made such supplemented PRUs.

The data relating to H16 allowed no conclusive

decision. The prediction of H16 was that upper SES mothers would more frequently make pre-response GRSs than would lower SES mothers, and that proportionately more of these upper SES GRSs would contain attribute labels than would those of the lower SES. The mean proportion of PRUs also classifiable as GRSs was significantly higher for upper than for lower SES mothers. But, for the mean proportions of these PRUs-cum-GRSs that also contained attribute labels, the SES comparison was reversed.

Probably the best way to summarize the overall findings with regard to the pre-response category would be to argue that no decisive interpretation was possible. Of the 11 SES comparisons made on the mother behaviors, eight yielded nonsignificant differences. Of the three specific hypotheses tested, one was partially supported, one was partially supported in reverse, and the other was left completely inconclusive.

Specific Hypotheses Relating to Post-response Category

Hypothesis H17 predicted that the post-response feedback given by the upper SES mothers would contain a greater proportion of attribute labels than would that given by the lower SES mothers. From Table 8 it can be seen that none of the relevant mother behavior variables for the post-response category yielded any significant SES differences. Thus H17 was not supported.

Hypothesis H18 predicted that the post-response feedback given by the upper SES mothers would instance proportionately more focusing than would that given by the lower SES mothers. This hypothesis was only minimally supported. The mean number of post correct response utterances supplemented by focusing was significantly greater for the upper rather than lower SES mothers. However, since these utterances were made by only three of the 75 lower SES mothers and eight of the 75 upper SES mothers, this finding could hardly be considered meaningful. Also, there were no significant SES differences on any of the other three relevant variables (see items 6, 15, and 16 in Table 8).

As an overall summary of the post-response category it would seem that, as with the pre-response category, no decisive interpretation was possible. Of the 14 SES comparisons made, only one yielded a significant difference. This paucity of significant corroborative findings allowed little if any interpretive importance to be attached to this lone instance that did occur.

Summary Discussion

As previously noted, phase one was based on a study by Brophy (1970). It is thus pertinent to compare the two sets of findings. In phase one of the present study, the only support for the arguments presented heretofore came

from the SES comparisons on those mother behaviors observed during the orientation period. However, it should be noted that this support was only partial and inconclusive. Further, no effective SES differences were found for the mother behaviors in either of the pre- or post-response categories. Consequently, any interpretive conclusion that substantive SES differences were found in such mother behaviors as focusing and label provision would be of a highly tentative nature.

In the Brophy study, which used essentially the same methodology as did phase one, substantial SES differences were found in the predicted direction in label verbalization and focusing behaviors for both the orientation and pre-response categories, and also in the duration of the orientation period. These findings were obviously not replicated in the present study, and thus some attempt at explaining the disparity would seem necessary.

Perhaps the first point that can be made is a procedural one. In the Brophy study, the preliminary training given to the mother alone was continued until the mother exhibited "... three consecutive errorless trials, each involving both placement of the blocks and verbalization of the sorting principle (1970, p. 83)." In the present study no such criterion was used. Training was continued only until the mother had expressed

comprehension of the requirements of the task.

Assuming that this procedural difference was critical, it is possible that the Brophy findings were reflecting SES differences in the ability of the mother to transfer criterion overlearning to the mother-child dyad situation. That is, the Brophy findings may not have constituted valid reflections of typical mothering behaviors. However, in fairness, this is not to say that the findings of the present study, with its methodological lack of mother overlearning, were any more valid than Brophy's. It should be remembered that Brophy's findings were corroborated by those of other related studies (eg. Tulkin & Kagan, 1970; Hess & Shipman, 1965). Thus, this procedural difference is probably only of minimal importance in accounting for the disparity between the findings of the Brophy study and those of phase one here.

A second possible explanation of the contrariety of the present study's findings also derives from a methodological point. The children used in Brophy's study were four-year-olds. The children used in this study were six-year-olds. It is possible that the block sorting task was too simple for these six-year-olds and thus the mothers did not need to resort to such strategies as label verbalization and focusing in order to effectively teach their children. A more difficult task may have elicited these maternal teaching strategies, even perhaps yielding

SES differences consonant with the rationale of the present study.

A third possible explanation centres upon the discussion of the upper and lower SES half samples at the beginning of this chapter. As was noted then, many of the lower SES mothers were high school graduates, and many of the upper SES mothers were first generation upper SES. Thus the two SES half samples would have overlapped considerably in terms of parental backgrounds. If it can be assumed that the child-rearing practices of mothers are influenced at least partially by their own familial backgrounds, then such an overlap could be expected to have led to similarities in these practices also.

The possibility that a wide range of child-rearing practices might have cut across both SES half samples is also supported by the demography of Edmonton. Being a relatively small city of comparatively recent growth, Edmonton does not have established ghetto areas similar to those found in older larger cities. Consequently, those lower SES areas that do exist are not extensive enough for their inhabitants to be isolated from the rest of the city's population. It is typically not the case that a majority of Edmonton's lower SES children go to schools attended only by children of equivalent SES. Similarly, lower SES neighbourhoods are typically not so extensive in Edmonton that the majority of lower SES mothers have only

infrequent social contact with upper SES mothers. In earlier work of this author (Eley, 1971) which involved children attending lower SES Edmonton schools, none of the schools used were found to be completely devoid of upper SES families.

Briefly then, the argument underlying this third possible explanation is that due to the overlap in familial backgrounds and the lack of social isolation in Edmonton, the child-rearing practices of the two half samples may have shown sufficient range and subsequent group similarity as to effectively mask over whatever SES differences may in fact have been present. It should be noted however that in both the Brophy (1970) and the Hess and Shipman (1965) studies mother-child differences were also found between upper SES mothers and mothers of skilled working class families similar to those of the lower SES half sample of the present study. Consequently, whatever validity there may be in the above argument it cannot on its own constitute the entire explanation for the lack of SES differences found here. Other factors such as the possible task difficulty effect mentioned previously must have also been involved.

A final possible explanation for the dearth of SES differences in the phase one findings relates to a basic assumption that necessarily underlies all studies of this type. It was assumed that the mother-child interaction

practices observed during phase one would reflect if not the frequencies then at least the types of interaction practices which typically occurred in the home. This assumption might not have been justified. Thus, the finding of minimal SES differences in the mothers' teaching behaviors observed during phase one may not have been indicative of a lack of such differences with respect to related behaviors exhibited in the everyday home setting.

Support for this final possibility was perhaps indicated by the finding that, for the orientation period, the upper SES children asked more questions, made more utterances, and more frequently used attribute labels than did the lower SES children. These differences must have originated somewhere, and perhaps the most logical explanation is that they were the result of differing parent-child interaction practices. However, from the arguments presented above regarding background overlap, and from further discussion on this point presented later in this chapter, it would seem that for Edmonton at least such differences in parental practices might not be neatly paralleled by differences in SES.

Discussion of General Hypothesis 2

The second general hypothesis related to predicted

differences between the phase two performances of upper and lower SES children on a straight forward visual discrimination task. The data relevant to this hypothesis was that from the pre-shift section of task one.

Even though the three specific hypotheses derived from this general hypothesis were stated in terms of SES comparisons, the data was analyzed with respect to the SES-verbal groupings described previously. It was hoped that through such groupings some assessment could be made of the explanatory importance of the mother's verbal tutoring practices in the interpretation of any SES differences in the children's performances.

Specific hypothesis H21 predicted that the upper SES children would require fewer pre-shift TTC on task one than would the lower SES. If such were the case, a significant SES-verbal x tasks interaction would have resulted in the repeated measures analysis of variance summarized in Table 12. This interaction was not significant so H21 was not supported.

Specific hypothesis H22 predicted that the task one pre-shift mean response latencies of the upper SES children would be longer than those of the lower SES children. From the summary of these comparisons in Table 14 it can be seen that for the trial-block immediately prior to criterion the mean response latency of the HiSES-HiV group was significantly greater than each of those of

the other three groups. These differences were in the direction predicted and thus H22 was partially supported.

If, as has been argued, upper SES mothers do use interactive procedures with their children that are facilitative of mediatory development, and if these procedures were reflected in the CMVSs used in forming the phase two experimental groups, then it would follow that the group most likely to exhibit evidence of mediatory processing and thus increased response latencies would be the HiSES-HiV group. However, none of the other trial-blocks in Table 14 yielded any significant SES-verbal comparisons. Further, none of the correlations of CMVS with each of the demographic variables were of substantial magnitude. Thus it would seem that although it was supportive of H22, this sole significant finding should not by itself be taken as reflecting any substantive underlying processing differences in the performances of the four phase two experimental groups.

The prediction of hypothesis H23 was that the upper SES learning curves for the pre-shift task one performance would show an abrupt rise to asymptote, whereas those of the lower SES children would rise gradually. From Figure 10 it can be seen that all of the learning curves were of the form hypothesized for only the upper SES. Thus H23 was not supported.

Summary Discussion

It would seem then that neither general hypothesis 2 nor its opposite were supported. No firm evidence was found that would confirm any of the predicted SES-verbal differences. In fact the data seemed to indicate that the subjects in all four experimental groups had been using some form of mediatory processing. Each of the learning curves in Figure 10 fluctuated around the chance level of response until just prior to criterion, at which instance they rose sharply to asymptote. The mean trial-block latencies in Table 14 were of the order of six seconds and greater for each experimental group. If the subjects in any of the groups had been responding in a non-mediated maximizing fashion, then gradually rising learning curves and short latencies would have been expected.

This lack of SES-verbal differences in the children's visual discrimination learning at least parallels the findings of a previous study by the present author (Eley, 1971). In that study it was found that when the response adequacy significance of a neutral feedback signal was explained to second grade children then there were no differences between the discrimination learning exhibited by upper and lower SES subjects. Since the feedback signal used in the present study was also thoroughly defined for the subjects, it can be seen that the performances of the six-year-olds used here were perhaps not all that

surprising, at least in an Edmonton context.

A possible explanation for the findings with respect to general hypothesis 2 derives from the argument presented earlier that the SES half samples used in the present study did not represent socioeconomic extremes. If the ranges in backgrounds for the two half samples were extensive enough to produce sufficiently extensive parallel ranges in mother-child interaction practices, then it could also be reasonably expected that sufficient numbers of the lower SES children might have developed mediatory processes to a level of sophistication that would have yielded the findings above.

If the development of such mediatory processes is functionally related to mother-child interaction practices, then a range in the latter would be expected to lead to a range in the former. For the pre-shift task one performances the TTC standard deviations for the four experimental groups were 78.81, 84.61, 103.21, and 107.63; obviously indicative of considerable variation. From Table 14 it can be seen that the standard deviations for the trial-block mean latencies were also relatively large. Thus it would seem that there was considerable variation in performance within each of the experimental groups, and that the above explanation is therefore at least tenable.

Before concluding this discussion related to the second general hypothesis, it would seem pertinent to make

some mention of the confounding phase two administration date effect detailed previously. It was possible that this confounding may have masked over some SES performance differences that were in reality present. Two points can be made in arguing that this possibility was highly unlikely.

First, the confounding effect was nested within the training versus control factor, and not within the SES-verbal factor. As has been argued, the confounding was most likely due to, first, an initial inadequacy in the phase two preliminary tutoring, and second, the fact that the subjects tested in the first few days of phase two's administration were all control condition subjects. Consequently, the control subjects suffered under the tutoring inadequacy whereas the training subjects did not. The important point here however is that the control subjects run in those first few days were drawn from both upper and lower SES half samples. The SES-verbal factor was thus crossed with respect to the confounding date effect, and therefore if any SES-verbal effects were in fact present then they should have been apparent regardless of the confounding.

The second point in this argument is really only corroborative of the first above in that if this first point is accepted then there is really no logical necessity for any further discussion on the issue.

Nevertheless, it can be noted that if there had been any masking of SES-verbal effects in the pre-shift task one performances, then these effects should also have been expected in the other aspects of the phase two observations. This expectation is especially germane when it is recalled that the correlations summarized in Table 4 indicated that the confounding date effect was apparent only for the pre-shift section of task one. Thus, the lack of substantive SES-verbal differences in any of the phase two observations would only seem to indicate that the interpretation taken regarding general hypothesis 2 was justified. That is, that there were no substantive SES-verbal differences in the task one pre-shift performances.

Discussion of General Hypothesis 3

The third general hypothesis referred to the post-shift learning of task one. It was expected that SES-verbal group comparisons regarding the relative difficulties of the ID and ED conditions would reflect accompanying group differences in mediatory sophistication.

Specific hypothesis H31 predicted that the upper SES children would require fewer post-shift TTC under an ID than under an ED shift condition. Support for this hypothesis would strictly speaking have required a

significant SES-verbal x ID-ED interaction in the post-shift task one analysis of variance summarized in Table 16. This interaction was not significant. However, the main ID-ED effect was significant, indicating that for the entire phase two sample the task one ID condition required fewer TTC than did the ED condition. Thus, indirectly at least, H31 was supported.

Specific hypothesis H32 predicted that the lower SES children would show no differences between the post-shift TTC under either shift condition. Strictly speaking, support for this hypothesis would have required no significant differences between any of the LoSES-HiV-ID, LoSES-HiV-ED, LoSES-LoV-ID, and LoSES-LoV-ED groups. The lack of significance in the SES-verbal x ID-ED interaction noted above thus seemed to support H32. However, since the main ID-ED effect was significant, it seemed that the more veridical interpretation was that H32 was in fact rejected. As with the upper SES children, it would seem that the lower SES children also exhibited lower post-shift TTC under the ID than under the ED task one condition.

The prediction of specific hypothesis H33 was that under the task one ID condition, the post-shift TTC for the upper SES subjects would be significantly lower than that for the lower SES subjects. The nonsignificant SES-verbal x ID-ED interaction indicated that H33 was not

supported.

Summary Discussion

Overall it would seem that this third general hypothesis was not supported. There were no differences in post-shift performances between any of the SES-verbal groups. For all subjects, the ID shift required fewer post-shift TTC than did the ED shift. According to the interpretive rationale underlying the use of shift paradigms, this finding would seem to indicate that at least with respect to these specific observations the upper and lower SES children had exhibited equivalent facility with mediatory processes.

A possible explanation for this finding parallels that presented with respect to general hypothesis 2. If the suspected SES half sample overlap regarding mother-child interaction practices was in fact extant, then such group equivalences with respect to mediatory processes would have been expected. For a range of 16.1 to 80.6 in the SES-verbal x ID-ED TTC cell means, the attendant standard deviations ranged from 11.8 to 59.8. Thus it would seem that there was sufficient variation in the task one post-shift performances for this explanation to remain tenable here also.

At this point it should be noted that the mediation construct is not the only plausible explanation for ID

versus ED performance differences. Perhaps the best developed alternative stems from the work of Mackintosh (1965). This writer argues for a two-stage attentional theory in which the subject must first learn to attend to the relevant stimulus dimension, and then to the relevant stimulus cue. The typical ID easier than ED finding is interpreted as resulting from a slower extinction rate for the dimensional as compared to the cue response. The lack of ID versus ED differences usually found with young children is seen as resulting from the relatively easy extinction of the dimensional response. As support for his interpretation Mackintosh cites his own findings that preshift overtraining with young children does lead to a stronger dimensional response and thence to easier ID (or reversal) versus ED performance.

Mackintosh criticizes the mediation construct as being too vague, and as ignoring what he sees as the necessity for some sort of assumptions regarding differential extinction rates for mediatory processes as compared to specific choice responses. As chief exponents of the mediation construct, the Kendlers (Kendler & Kendler, 1966) comment on Mackintosh's analysis by first noting that the mediation construct is deliberately vague in order that various theoretical options might be left open to empirical elaboration (Kendler & Kendler, 1969). Further, the Kendlers note that Mackintosh has failed to

distinguish between those processes involved in the selection of stimuli to orient towards, and those involved in the organization of a perceived stimulus pattern into an effective controlling stimulus. In short, the Kendlers argue that the implied claim that a selective attention hypothesis is any more precise than the mediation construct is doubtful.

In general, the Kendlers seem to take a somewhat eclectic stance. They acknowledge the possibility of differential extinction rates, but prefer to leave this possibility as tentative because they feel that current evidence does not justify a firmer stand. They acknowledge Mackintosh's overtraining findings, but argue that the crucial point with respect to ontogenetic changes is that for the young child such overtraining is in fact necessary to produce ID versus ED differences, but not so for the older child. Further, the Kendlers note that many processes might be involved in mediation (Kendler & Kendler, 1971), such as selective attentional mechanisms, but that their role and importance must await experimental clarification.

The author of the present study takes a stance quite close to that of the Kendlers. It is felt that enough evidence exists for the mediation construct to be a viable hypothesis, and further, that this evidence would seem to indicate that the development of mediatory processes might

be linguistically based. However, this stance is not a denial of the possibility of non-mediatory processes, nor of the possibility of non-linguistic mediation. It is conceivable that such processes could function in cooperative conjunction with linguistically based mediation.

Discussion of General Hypothesis 4

The fourth and final general hypothesis related to predicted differences between upper and lower SES children with respect to the effects of a training sequence on visual discrimination performance. Following training in the use of mediatory processes, the discrimination performances of the lower SES subjects were expected to reflect a greater mediatory improvement than were those of the upper SES subjects.

The rationale underlying this general hypothesis was founded upon two of the basic arguments central to the present study. First, the use of mediatory processes by the child was argued to be at least partially a function of the mother-child verbal interaction practices used by the mother. Second, the development in the child of these mediatory processes was argued to be a learning phenomenon. It followed from these two arguments then that children relatively unsophisticated in mediatory

processing, as the lower SES children were expected to be, should be susceptible to training in same. Further, it also followed that children relatively facile in mediatory processing, as the upper SES children were expected to be, should exhibit comparatively lesser post-training improvement in what should already be superior performances.

Specific hypothesis H41 predicted that the decrease in pre-shift TTC from task one to task two would be greater for the lower than for the upper SES training condition subjects. Support for H41 required a significant SES-verbal x training-control x tasks interaction in the repeated measures analysis of variance summarized in Table 12. This interaction was not significant and thus H41 was not supported. As argued in the previous chapter, the significant training-control main effect and the significant training-control x tasks interaction were both most likely only reflecting the confounding administration date effect. Thus the only credible effect from this analysis was the tasks main effect which indicated that for all subjects, regardless of SES-verbal or training-control grouping, the pre-shift task two TTC was significantly less than that for task one.

Specific hypothesis H42 predicted that the post-training latencies for the lower SES children would be greater than their pre-training latencies, and that this

difference in latencies would be larger than a parallel difference observed for the upper SES children. This hypothesis was not supported. From Tables 14 and 15 it can be seen that not only were there no substantive SES-verbal group differences in the pre-shift latencies for either task one or two, but that all subjects, regardless of training-control grouping, exhibited a latency decrease rather than increase from task one to task two.

Specific hypothesis H43 predicted that, following training, the pre-shift learning curves for both upper and lower SES subjects would evidence abrupt rises to asymptote. From Figure 11 it can be seen that strictly speaking H43 was supported. However, since there were no SES-verbal differences in the task one pre-shift learning curves, and since there were no training versus control differences in the task two pre-shift learning curves, it would not be justifiable to claim that this support for H43 was in any way supportive of the rationale underlying general hypothesis 4.

Specific hypothesis H44 predicted that, following training, both upper and lower SES subjects would require fewer post-shift TTC under an ID than under an ED shift condition. Support for H44 would have required a significant SES-verbal x training-control x ID-ED x pre- to post-shift interaction in the repeated measures analysis of variance summarized in Table 18. This

interaction was not significant so H44 was not supported. In fact none of the effects involving the SES-verbal or training-control factors were significant. The ID-ED main effect and the ID-ED x pre- to post-shift interaction, both of which were significant, indicated that, regardless of SES-verbal and training-control grouping, post-shift performance suffered relative to pre-shift under the ED condition and improved under the ID condition.

Summary Discussion

Since none of the previous general hypotheses received any substantive support from the data of this study, the corroborative nature of the above findings regarding this fourth general hypothesis should not be surprising. There was nothing to indicate any differences among the SES-verbal groups with respect to the effect of the training versus control factor. In fact, there was nothing to indicate that the intervening training sequence had had any differential effect at all compared to the control condition.

The explanation that can be employed to account for these findings follows that detailed earlier regarding the suspected overlap in child-rearing practices between the SES half samples. If sufficient numbers of the lower SES children had developed a facility with mediatory processes, then the above lack of SES differences would be

expected.

The apparent ineffectiveness of the intervening training sequence can be interpreted in at least two ways. First, the training condition may in fact have been effective, but only minimally so compared to the practice effects of performing the experimental tasks. If both upper and lower SES subjects already had some minimum of mediatory proficiency before they began task one, then the execution of that task may have had the effect of raising the level of this proficiency. Moreover, it is also reasonable that such practice effects could have raised this mediatory proficiency to some hypothetical ceiling, thus negating the possibility of further improvement via the intervening training sequence.

The possibility of such a proficiency ceiling was perhaps evidenced by the task two finding that the post-shift mean TTC for the ED subjects was essentially greater than the pre-shift mean TTC. It would seem that the mediatory processing in the pre-shift section of task two was at a proficiency level sufficient for the ED shift to occasion a real drop in performance. If the hypothesized proficiency ceiling had not been attained, the post-shift ED performance, while still being poorer than that under the ID condition, would likely have actually been better than the pre-shift performance.

The second possible explanation for the training

condition's ineffectiveness relates to the training itself. As described previously, the training condition involved the subject viewing a film which showed an adult model solving a discrimination task similar to that of the pre-shift section of task one while simultaneously verbalizing his mediatory processes. It may be that such training was simply not adequate. Perhaps the modeling used should have been supplemented by some sort of practice session. However, whatever the possibilities, the improvement of the training sequence is essentially an empirical question, basically answerable only through research.

In conclusion, the reasons for the ineffectiveness of the training sequence might not necessarily be simple, nor even additive. Two possible explanations have been presented, but the overall answer might involve either, both, or some combination with other unidentified variables.

General Discussion and Conclusions

Before summarizing the preceding discussion there are a few methodological issues that should be mentioned. First, from the phase two procedure described in chapter four it will be recalled that individual tutoring was given to those subjects who exhibited inordinate

difficulties during the execution of the experimental tasks. Essentially, this tutoring took the form of reminding the subject of the aim of the computer game, of the meaning of the feedback signal, and of the candy bar that would follow successful completion of the game. The possibility exists that such special tutoring may in fact have also been at least partially training the subject in the use of mediatory processes, thus perhaps masking any SES-verbal or training-control effects. Because of its obvious implications regarding the interpretation of the findings of the present study, it is imperative that this possibility be adequately dealt with. In this respect there are two points that can be made.

First, it should be remembered that this special tutoring was given only to those subjects who were experiencing inordinate difficulties, and who were thus likely to have already accumulated relatively large numbers of trials. Thus, even if this possible extraneous training effect was operating, any SES-verbal differences should still have been apparent. No such differences were found.

The second point is really a corollary of the first above. As noted in chapter four, this special tutoring occurred predominantly during the pre-shift section of the first task. Thus, even if this extraneous training was extant, if any SES-verbal differences were in fact present

then they should have been apparent at least in this task one pre-shift section. They were not.

In summary, while the possibility of extraneous training can not strictly be rejected, it seems at least reasonable to expect that its effect if any was minimal. Only a minority of subjects experienced this special tutoring to any large extent. The form of the tutoring was such as to merely remind the subject of information already given during the preliminary instructions. And, as argued above, some SES-verbal differences, if they existed, should have occurred regardless. Thus it would seem that the interpretations made of the data from this study can be allowed to stand.

A second methodological issue relates to the representativeness of the sample. There could have been what Campbell and Stanley (1963) refer to as an interaction between subject selection and the experimental procedures used in this study. Since participation was voluntary, those subjects who did volunteer may not have been representative of the population at large. Further, since the refusal rate was higher for the lower than for the upper SES subjects, the lower SES volunteers may have been better child rearers and trainers, and thus perculiarly more conscientious, than their non-volunteering peers. If such a selection bias was indeed operative, then its effect would likely have been to

reduce the hypothesized SES comparison differences. Thus, the nonsignificant SES comparisons found in this study could have been at least partially due to subject selection biases which differentially affected the upper and lower SES samples.

So long as societal mores prohibit the conscription of subjects, psychological studies are always going to be susceptible to the selection bias problem noted above. Thus the only course open to researchers is to use subject selection procedures which hopefully minimize the potential effects of this bias. In general this would mean ensuring that the experimental sample is drawn from as many of the subgroups within the underlying population of interest as is possible. While differential volunteer rates may still occur, all population subgroups should at least be given equivalent opportunity of participation.

Such precautions of a general nature were taken in selecting the sample for the present study. Potential subjects were initially contacted by the experimenter, as opposed to their being requested to come forward as volunteers. Only those families who fulfilled the sampling requirements of the study were contacted. The only decision required of a potential subject was whether or not to participate. Thus, while a selection bias was still possible it would seem reasonable to expect that it was minimal.

A third methodological issue concerns the possibility that participation in this study may have constituted a generally motivating situation. Further, the lower SES subjects may have been more affected by this general motivation than the upper SES. For the upper SES subjects the university environment, with apparatus such as video recorders and computers, might not have loaded quite so high in novelty value as was perhaps the case for the lower SES. It is thus conceivable that a greater general motivation on the part of the lower SES subjects may have effected a performance boost sufficient to at least partially mask any underlying SES differences.

Within the context of the present study there is no methodological counter to the above point. However, insofar as the likely effect of such general motivation would be to raise the level of performance close to some hypothetical competency level, the effect might not have been contrary to the aims of this study. With respect to the children's performances in phase two, the purpose of the study was to discern any differences in mediatory proficiency that may have been extant. Such a purpose would seem to require that the subjects should all be sufficiently motivated to perform close to their best.

A fourth methodological issue relates to the procedures used in scoring the phase one dyad observations. From chapter four it will be recalled that

the phase one mother and child behaviors were scored, by the author, from identification coded video recordings. Since some 150 families were involved in phase one it was hoped that this identification coding would minimize the chances of the author recalling the SES of any one subject. Some four months after this initial phase one scoring, a random sample of 25 recordings was re-scored by the author. The resulting two sets of scores were then correlated to yield the reliability coefficients reported in chapter five.

The criticism that can be made regarding this scoring procedure is that it was open to experimenter bias. Since the scoring was done by the author, it is conceivable that his knowledge of the phase one hypotheses might have led to the use of different implicit standards for the two SES samples. Further, the reliability coefficients calculated provide no indication of this possible bias. Since the re-scoring was also done by the author, the coefficients do not strictly index the reliability of the phase one measures per se, but rather the consistency of the author's scoring, whatever standards he was in fact using.

The appropriateness of this criticism would seem to depend upon whether the author could in fact recall the SES of the subjects as their recordings were being scored. While such recall would be hard to deny entirely for the first set of scorings, it would seem reasonable to expect

some loss in SES recall for the second reliability scorings. Moreover, if the suggested SES scoring bias had been operative, such a loss in SES recall could be expected to lead to a lack of first and second scoring agreement, and thus to relatively low reliability coefficients. From chapter four it was seen that such was not the case. The reliability coefficients were in fact quite high. Thus, while the above criticism is valid and therefore signals a flaw in the phase one scoring procedures, it would nevertheless seem reasonable to conclude that the effects of any scorer bias were likely to have been minimal.

The final methodological issue that seems needy of discussion here concerns the possibility of differential ethnic influences. It could be argued that parent-child interaction patterns might differ between families of different ethno-cultural backgrounds, and that these differences in turn might lead to different prefered styles of learning in the children. Consequently, research concerned with familial practices should take account of ethnicity in the selection of experimental samples. Such account was not taken in this study and thus in this respect this issue represents a criticism. There was no a posteriori way in the present study of effectively determining whether the large within-group variances were in some way related to subject ethnicity.

Nevertheless, it would seem that while ethnicity effects could not be analyzed in the present study, they might at least have been inadvertently controlled for. Perusal of the subjects' surnames revealed that, for the phase two sample, 34 of the upper and 30 of the lower SES subjects had surnames of British origin, while 30 of the upper and 34 of the lower SES subjects had surnames of various non-British ethnic origins. Thus, to the extent that surnames are valid indicators of ethnic background, it would seem that ethnicity, at least on a British versus non-British split, might have been counterbalanced.

The overall conclusion that can be made regarding this study is that it was singularly inconclusive. The findings from phase one yielded only meager support for one section of the predictions, namely that relating to the orientation period. In general there was no substantial evidence for any SES differences with respect to mother-child interaction practices. This finding may have been due to the sorting task having not been difficult enough to elicit the mother behaviors at a level where differences might have become apparent. It may have been due to a possible sample overlap in familial backgrounds which would imply an accompanying overlap in child-rearing practices. It may have been due to the phase one procedure simply being inadequate as a means of yielding valid reflections of what mother-child practices

actually took place in the home setting.

Whatever the causes, phase one was just simply ineffective. None of the correlations between the phase two dependent variables and the phase one mother and child behavior variables approached anything like theoretically interesting magnitudes.

The findings from phase two indicated that not only were there no SES performance differences, but that both upper and lower SES children seemed to evidence mediatory processing. All groups exhibited learning curves rising sharply to asymptote, relatively long response latencies, and greater ease with ID than with ED shifts.

How then are all these findings to be reconciled? The first point that can be made is that the basic thesis of the present study remains tenable. The findings heretofore reported do not necessarily reject the proposition that the development of mediatory processes in the child is functionally related to the mother-child interaction practices used by the mother. If it is assumed that development is basically a learning process involving the accumulative acquisition of repertoires of behavior (eg. Staats, 1971), and thus that performance differences are reflections of previous learning differences, then it follows that a conclusion of no differences in mother behaviors would require relatively small within-group variances in the phase two performances. Such was not the

case.

The relatively large within-group variances noted previously for phase two would thus seem to imply that there were differences in child-rearing practices. The lack of SES-verbal effects however, would imply that such differences were not nested within SES, at least for those levels of SES sampled, and within an Edmonton context. Further, the lack of any sizeable correlations between the phase two perfcrmance measures and the various measures derived from the demographic information would imply that neither are these child-rearing differences necessarily related directly to any of the specific economic and educational factors normally associated with SES.

Whatever the specific causal variables are in the development of mediatory processing, it would seem that their relationship to the proficiency of such processing is not likely to be simple. The analyses of variance summarized in Tables 20 and 21 compared the post-shift performances of subjects whose pre-shift performances were either above or below the median respectively. If the differing pre-shift performances were indicative of differing levels of mediatory processing sophistication, then the poor pre-shift performance subjects should have shown relatively little difference between their ID and ED post-shift performances. In contrast, the ID versus ED comparison for the high pre-shift performance subjects

should have yielded a relatively large difference. In short, there should have been significant pre-shift x ID-ED interactions. Such was not the case. Neither analysis of variance showed any but the ID-ED main effect to be significant. Thus it would seem that whether or not a child exhibits mediatory processing may not be simply related to his proficiency at same.

Finally then, the findings allowed for neither support nor denial of the general hypotheses, and thus no conclusive decisions could be made. Nevertheless the present study did indicate a few pointers for future research. First, procedures such as that used in phase one are probably inappropriate as a means of sampling mother behaviors. This would seem especially pertinent when it is remembered that the purpose of such procedures is to allow for inferences regarding the behaviors typically exhibited by mothers. Probably the only valid technique for gathering such data is to observe the mother directly in her own home.

Second, when sampling within levels of SES it would seem very important to ensure that the resulting samples are truly representative of extremes. Such a practice would probably mean either working with much smaller samples than that used in the present study, or alternatively, confining large sample SES studies to larger centres than Edmonton. This notwithstanding, the

lack of SES-verbal group differences in the present study is perhaps also indicative of a minimal utility for the SES variable with respect to mediatory development research.

Third, and finally, in procedures similar to that of phase two it is important to take possible practice effects into account when assessing the potential effectiveness of some sort of supplementary training condition. Perhaps some subjects should be administered just the training-control condition followed by the second experimental task.

Implication for Education

Although this study was largely inconclusive, the lack of SES differences in the phase two performances would nevertheless seem to have at least one important implication for education.

The learning environment of the typical school classroom is usually a relatively unstructured entity. Even in an autocratic, teacher-dominated situation the learning efficiency of any one child will be very much a function of the work-study skills possessed by that child. There will thus be ample scope for any differences in attentional, self-directing, and general study skills of the children to effect parallel differences in classwork.

The more unstructured the situation of course, the greater should be the scope for such potentially functional learning skills to become functional. If these learning skills are related to familial background variables which in turn are related to SES, then it becomes easy to understand how SES differences in classroom performance have in the past been fairly readily attainable.

In contrast to the typical classroom, the situation in phase two of the present study was relatively highly structured. The tasks were extensively defined, the subjects were very closely monitored, and each subject effectively had the individual attention of the computer. Consequently, many of the skills that would be functionally related to classroom performance were probably neutralized as effective sources of variance with respect to performance on the experimental tasks. No significant SES performance differences were obtained.

The implication would seem to be then that one way of offsetting the effects of SES in the classroom would be to more highly structure the learning activities of the students. The more clearly task performance requirements are defined, and the more effectively student performances are monitored and guided, then the less scope there would appear to be for differences in extraneous learning skills to become functionally important.

For the teacher, this implication would mean a number

of things. First, for each instructional unit a task analysis would be required to determine exactly what skills the student would need to possess in order to proceed through the unit. Second, some evaluative screening would be needed to ensure that students entering an instructional unit did in fact possess these prerequisite skills. Third, the expected learning outcome of the unit would need to be explained to the student in behavioral terms, and if practicable, modeled for him. Fourth, specific guiding instructions would be needed in order to facilitate the student's smooth progress through the unit. Fifth, some overall evaluative procedure would need to be devised to both assess the adequacy of the student's final performance as well as provide monitoring feedback on the student's progress through the unit. Taken together, the effect of these five pointers should be to significantly lessen the possibility that success in some instructional unit will depend upon proficiency in some non-specified skill.

For the school counsellor, the implication drawn from this study would indicate the need for an increased sensitivity to the causes of student failure. It might be that the specific class in which failure is occurring is structured along informal, nonguided lines. In such a class, student success would be dependent upon the possession of relatively sophisticated study skills on the

part of the student. The student lacking in these skills would be thus expected to exhibit failure, not necessarily due to a lack of task-specific ability, but because the class structure did not provide the support that he needs. The counsellor should be aware of this possibility.

For the school administrator, implementation of the above implication would mean a greater flexibility requirement in time tabling, and the possibility of hiring ancillary staff. The increased specification and structuring of learning activities would imply an increased unitization of materials and classwork. Such unitization would imply an increased individualization of instruction, which in turn would seem to imply a need for time tabling flexibility. Also, such individualization would seem to imply a need for ancillary staff to cope with the expected increase in general supervisory and evaluative duties.

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APPENDIX A

Socioeconomic Status of Occupations in Canada

(Blishen, 1968, pp. 745-750)

Occupation	Socio-economic index	Occupation	Socio-economic index
Chemical engineers	76.69	Owners and managers, paper and allied industries	64.78
Dentists	76.44	Owners and managers, finance, insurance, real estate	64.53
Professors and college principals	76.01	Authors, editors, journalists	64.23
Physicians and surgeons	75.57	Owners and managers, rubber industries	64.09
Geologists	75.49	Owners and managers, machinery industries	63.76
Mining engineers	75.42	Librarians	63.75
Lawyers and notaries	75.41	Owners and managers, petroleum and coal products industries	63.02
Civil engineers	75.16	Sales managers	62.04
Architects	74.52	Owners and managers, mines, quarries, and oil wells	61.99
Veterinarians	74.48	Owners and managers, textile industries	61.96
Electrical engineers	74.34	Owners and managers, transportation equipment industries	61.75
Professional engineers, n.e.s.	74.27	Professional occupations, n.e.s.	60.93
Physicists	73.81	Credit managers	60.81
Optometrists	73.77	Office managers	60.42
Biological scientists	73.22	Owners and managers, health and welfare services	60.07
Physical scientists, n.e.s.	72.94	Security salesmen and brokers	59.91
Pharmacists	72.87	Radio and television announcers	59.81
Mechanical engineers	72.78	Owners and managers, printing, publishing, and allied industries	59.69
Judges and magistrates	72.24	Owners and managers, federal administration	59.60
Economists	71.89	Owners and managers, knitting mills	59.28
Chemists	70.94	Clergymen and priests	59.20
Industrial engineers	70.43	Owners and managers, miscellaneous manufacturing industries	58.29
Osteopaths and chiropractors	70.25	Other health professionals	58.27
School teachers	70.14	Artists (except commercial), art teachers	58.21
Accountants and auditors	68.80	Inspectors and foremen, communication	58.17
Owners and managers, education and related services	68.32		
Actuaries and statisticians	67.78		
Computer programmers	67.50		
Owners and managers, services to business management	67.28		
Agricultural professionals, n.e.s.	66.96		
Owners and managers, chemical and chemical products industries	66.79		
Advertising managers	66.05		
Air pilots, navigators, and flight engineers	66.04		
Owners and managers, electrical products industries	65.78		
Owners and managers, primary metal industries	65.29		

Occupation	Socio-economic index
Draughtsmen	57.82
Owners and managers, metal fabricating industries	57.60
Owners and managers, leather industries	57.33
Social welfare workers	55.62
Owners and managers, non-metallic mineral products industries	55.41
Advertising salesmen and agents	55.37
Purchasing agents and buyers	55.22
Insurance salesmen and agents	55.19
Owners and managers, clothing industries	54.77
Science and engineering technicians, n.e.s.	54.75
Brokers, agents, and appraisers	54.74
Owners and managers, provincial administration	54.54
Artists, commercial	54.06
Owners and managers, transportation, communication, and other utilities	53.85
Owners and managers, wholesale trade	53.80
Owners and managers, local administration	53.29
Surveyors	53.25
Commercial travellers	52.68
Owners and managers, furniture and fixtures industries	52.11
Teachers and instructors, n.e.s.	52.07
Stenographers	51.96
Owners and managers, food and beverage industries	51.70
Radio and television equipment operators	51.51
Physical and occupational therapists	51.11
Athletes and sports officials	51.11
Musicians and music teachers	50.93
Nurses-in-training	49.91
Bookkeepers and cashiers	49.53
Funeral directors and embalmers	49.47
Foremen, transportation equipment industries	49.21
Foremen, primary metals industries	49.11
Real estate salesmen and agents	48.74
Medical and dental technicians	48.58
Photo-engravers	48.26
Photographers	48.07
Engravers (except photo-engravers)	47.95
Ticket, station, and express agents, transport	47.81
Batch and continuous still operators	47.60
Office appliance operators	47.12
Owners and managers, construction industries	46.95
Foremen – electric power, gas, and water utilities	46.75
Power-station operators	46.20
Locomotive engineers	45.99
Conductors, railroad	45.68
Owners and managers, wood industries	45.52
Owners and managers, miscellaneous services	45.48
Foremen, paper and allied industries	45.36
Owners and managers, motion picture and recreational services	45.19
Linemen and servicemen – telephone, telegraph, and power	45.05
Foremen, other manufacturing industries	45.01
Lithographic and photo-offset occupations	45.00
Toolmakers, diemakers	44.82
Inspectors, construction	44.76
Interior decorators and window-dressers	44.57
Foremen, trade	44.32
Foremen – mine, quarry, petroleum well	44.27
Telephone operators	44.20
Owners and managers, forestry, logging	44.00

Occupation	Socio-economic index
Actors, entertainers, and showmen	43.85
Owners and managers, retail trade	43.69
Mechanics and repairmen, office machines	43.05
Clerical occupations, n.e.s.	42.96
Mechanics and repairmen, aircraft	42.76
Nurses, graduate	42.57
Compositors and typesetters	42.30
Deck officers, ship	42.13
Religious workers	41.84
Members of armed forces*	41.43
Locomotive firemen	40.92
Electricians, wiremen, and electrical repairmen	40.66
Auctioneers	40.48
Canvassers and other door-to-door salesmen	40.23
Brakemen, railroad	40.22
Paper-makers	40.17
Owners and managers, personal services	40.14
Printing workers, n.e.s.	40.13
Mechanics and repairmen, radio and TV receivers	40.12
Photographic processing occupations	40.05
Engineering officers, ship	39.86
Millwrights	39.83
Inspectors, graders, and samplers, n.e.s.	39.82
Inspectors, examiners, gaugers — metal	39.78
Pattern-makers (except paper)	39.75
Typists and clerk typists	39.66
Postmasters	39.65
Well-drillers and related workers	39.53
Foremen, all other industries	39.54
Pressmen, printing	39.49
Telegraph operators	39.37
Inspectors and foremen, transport	39.21
Projectionists, motion picture	39.15
Foremen, textile and clothing industries	39.06
Lens grinders and polishers; opticians	38.82
Bookbinders	38.54
Foremen, food and beverage industries	38.21
General foremen, construction	37.90
Operators, electric street railway	37.80
Stationary engineemen	37.79
Rolling-mill operators	37.76
Chemical and related process workers	37.75
Prospectors	37.73
Foremen, wood and furniture industries	37.63
Sales clerks	37.14
Machinists and machine-tool setters	36.90
Jewellers and watchmakers	36.55
Civilian protective service occupations†	35.80
Stewards	35.32
Farm managers and foremen	35.05
Other occupations in bookbinding	34.97
Baggagemen and expressmen, transport	34.85
Metal-treating occupations, n.e.s.	34.79
Mechanics and repairmen, n.e.s.	34.77
Riggers and cable splicers, except telephone and telegraph and power	34.77
Furnacemen and heaters — metal	34.75
Cellulose-pulp preparers	34.69
Stock clerks and storekeepers	34.63
Logging foremen	34.61
Beverage processers	34.44

* Includes commissioned officers, armed forces; and other ranks, armed forces.

† Includes firemen, fire protection; policemen and detectives; and guards, watchmen, n.e.s.

Occupation	Socio-economic index
Plumbers and pipefitters	34.58
Heat-treaters, annealers, temperers	34.09
Paper-making occupations, n.e.s.	34.07
Hoistmen, craanemen, derrickmen	34.06
Inspectors, graders, scalers – log and lumber	33.80
Electrical and electronics workers, n.e.s.	33.80
Switchmen and signalmen	33.76
Fitters and assemblers – electrical and electronics equipment	33.57
Sheet-metal workers	33.49
Metal drawers and extruders	33.40
Miners	33.38
Bartenders	33.29
Insulation appliers	33.22
Roasters, cookers, and other heat-treaters, chemical	33.14
Furriers	33.03
Boiler-makers, platers, and structural metal workers	32.93
Welders and flame cutters	32.79
Timbermen	32.61
Tire- and tube-builders	32.34
Filers, grinders, sharpeners	32.18
Service workers, n.e.s.	32.17
Nursing assistants and aides	32.14
Shipping and receiving clerks	32.14
Millmen	32.13
Bus drivers	31.86
Forest rangers and cruisers	31.85
Metalworking-machine operators	31.67
Quarriers and related workers	31.61
Moulders	31.32
Porters, baggage and pullman	31.30
Mechanics and repairmen, motor vehicle	31.30
Mechanics and repairmen, railroad equipment	31.29
Fitters and assemblers – metal	31.28
Crushers, millers, calenderers – chemical	31.12
Electropleters, dip platers, and related workers	31.07
Cutters, markers – textiles; garment and glove leather	31.06
Production process and related workers, n.e.s.	31.00
Lodging and boarding housekeepers	30.94
Barbers, hairdressers, and manicurists	30.94
Cabinet- and furniture-makers, wood	30.88
Driver–salesmen	30.74
Labourers, primary metal industries	30.68
Metalworking occupations, n.e.s.	30.60
Deck ratings (ship), barge crews and boatmen	30.56
Paper products makers	30.53
Postmen and mail carriers	30.52
Service-station attendants	30.48
Butchers and meat-cutters	30.48
Meat-canners, curers, packers	30.48
Motormen (vehicle), except railway	30.48
Waiters	30.47
Hawkers and peddlars	30.43
Oilers and greasers – machinery and vehicles (except ship)	30.43
Tobacco preparers and products makers	30.39
Upholsterers	30.27
Tailors	30.26
Labourers, trade	30.19
Bleachers and dyers – textiles	30.18
Painters (construction and maintenance), paperhangers, and glaziers	30.08
Taxi drivers and chauffeurs	30.07
Operators of earth-moving and other construction machinery	30.06
Painters (except construction and maintenance)	30.00
Corsemakers	30.00
Baby sitters	29.99
Labourers, mine	29.96

Occupation	Socio-economic index
Blacksmiths, hammermen, forgemen	29.96
Bricklayers, stonemasons, tile-setters	29.96
Attendants, recreation and amusement	29.92
Plasterers and lathers	29.90
Other food-processing occupations	29.89
Bottlers, wrappers, labellers	29.80
Clay, glass, and stone workers, n.e.s.	29.77
Materials-handling equipment operators	29.76
Labourers, paper and allied industries	29.73
Carpenters	29.71
Vulcanizers	29.62
Fruit- and vegetable-canners and packers	29.60
Other rubber workers	29.51
Labourers, communication and storage	29.51
Milk processors	29.49
Cooks	29.48
Construction workers, n.e.s.	29.48
Longshoremen and stevedores	29.41
Truck drivers	29.31
Gardeners (except farm) and groundskeepers	29.27
Bakers	29.26
Labourers, electric power, gas, and water utilities	29.26
Messengers	29.23
Warehousemen and freight-handlers	29.18
Polishers and buffers – metal	29.12
Boiler firemen (except ship)	29.10
Labourers, all other industries	28.96
Launderers and dry cleaners	28.93
Other agricultural occupations	28.93
Dressmakers and seamstresses	28.77
Riveters and rivet-heaters	28.76
Millers of flour and grain	28.75
Furnacemen and kilnmen, ceramics and glass	28.69
Knitters	28.66
Transport occupations, n.e.s.	28.66
Labourers, other public administration and defence	28.61
Woodworking occupations, n.e.s.	28.56
Stone-cutters and dressers	28.52
Apparel and related products makers	28.44
Tanners and tannery operatives	28.42
Sawyers	28.29
Woodworking-machine operators	28.29
Labourers, other manufacturing industries	28.22
Janitors and cleaners, building	28.22
Labourers, food and beverage industries	28.12
Kitchen helpers and related service workers	28.11
Engine-room ratings, firemen and oilers, ship	28.11
Newsvendors	28.08
Labourers, railway transport	28.03
Finishers and calenderers	27.97
Elevator-tenders, building	27.96
Shoemakers and repairers, not in factory	27.87
Sewers and sewing-machine operators	27.87
Cement- and concrete-finishers	27.86
Guides	27.79
Farm labourers	27.77
Labourers, transportation (except railway)	27.72
Labourers, wood industries	27.57
Labourers, transportation equipment industries	27.49
Other textile occupations	27.44
Carders, combers, and other fibre-preparers	27.37
Labourers, construction	27.25
Other leather products makers	27.19
Fishermen	27.17
Leather-cutters	27.10
Loom-fixers and loom-preparers	27.09
Lumbermen, including labourers in logging	27.01

Occupation	Socio-economic index	Occupation	Socio-economic index
Spinners and twisters	28.94	Labourers, textile and clothing industries	26.56
Weavers	28.77	Shoemakers and repairers – in factory	26.56
Teamsters	26.71	Fish-canners, curers, and packers	26.09
Labourers, local administration	26.71	Trappers and hunters	25.36
Winders and reelers	26.63		
Sectionmen and trackmen	26.57		

Letter to Parents

, 1972

Dear Parents:

The Educational Psychology Department of the University of Alberta has attracted to the University a large group of staff and graduate students who are interested in research in child learning and development.

During the next 12 months we will be engaging in research projects designed to clarify those processes involved in the development of cognitive mediatory processes in young children.

We will be very grateful if you would consent to your child taking part in this research.

Your participation would involve two visits to the university, about three weeks apart, and of approximately 30 minutes to an hour's duration each. Transport will be provided if you need it. The timing of these two visits will be set to allow for your convenience. A trained research worker will be present at all times.

The results of this research will, of course, merely provide statistical information for our psychological analyses. They will be confidential, and will NOT be used in any way in connection with your child's work in school.

Could you please complete the attached form and return it to us in the pre-paid envelope as soon as possible? If you have any questions or doubts please do not hesitate to telephone either myself (at 432-4439) or Mr. Malcolm Eley (at 432-5807) during office hours.

Yours sincerely,

Gerard Kysela, Ph.D.
Associate Professor

Permission Form

TO: Department of Educational Psychology
(ref.: Kysela/Eley)

Name of child: .....

Home address: .....

Date of birth of child: .....

No. of children in family: .....

Please check one of the following:

I hereby give my permission for my child to participate in this project, part of the Educational Psychology research being conducted at the University of Alberta. .....

I would rather not have my child participate in this project. .....

Exact title and description of present or last occupation of family supporter. .....

.....

Occupations of child's grandfathers: .....

Paternal: .....

Maternal: .....

Please check the category which best describes your last year of formal education:

Father:	.....	.....	.....	.....	.....
Mother:	.....	.....	.....	.....	.....
	Gr. 9 & below	Gr's 10	11	12 &/or 13	Univ. or coll.

Parent's Signature: .....

Date: .....

Phase One Information Sheet

Name:.....

Address:..... Date:.....

Is English the only language used in the home?

Yes ( ) No ( )

If "No", what percentage of conversation with the child is in English? .....%

Is the child enrolled in kindergarten or pre-school?

Yes ( ) No ( )

If "Yes", total years of enrolment. .....

For how many of the last 10 years have you been resident in:
i. Alberta? ..... ii. Canada?.....

If less than 10 for "ii.", were you resident in an English speaking community prior to your residence in Canada?

Yes ( ) No ( )

How many of the last 10 years have been spent in:

i. an urban setting? ..... ii. a rural setting? .....

Phase One Score Sheet -- Mother

Subject #.....

Orientation

Duration in seconds: .....

Concept presentation scores: Size 0( ) 1( ) 2( ) 3( )

Color 0( ) 1( ) 2( ) 3( )

Number of global rule statements made .....

Number of these containing attribute labels ....%

Pre-response

Total number of distinct pre-response utterances made .....

Number containing both verbal attribute labels ....%

Number containing one or both verbal attribute labels ....%

Number supplemented by focusing, verbal or gestural ....%

Number of these utterances that were global rule statements ....%

Number of these containing one or both attribute labels ....%

Post-response

Total number of post correct response feedback utterances .....

Number containing attribute labels ....%

Number supplemented by focusing ....%

Number containing global rule statements ....%

Total number of post incorrect response feedback utterances .....

Number containing attribute labels ....%

Number supplemented by focusing ....%

Number containing global rule statements ....%

Phase One Score Sheet -- Child

Subject #.....

Orientation

Total number of questions asked or utterances made	.....	
Number of these relating to sorting attributes	.....	.....%
Number of these relating to global rule statements	.....	.....%
Number of these that involved actual use of at least one attribute label	.....	.....%

Sorting Responses

Total number of sorting responses that were preceded by a distinct pre-response utterance by the mother	.....	
Number that were correct according to the intent of the preceding utterance	.....	.....%
Number that were incorrect according to the intent of the preceding utterance	.....	.....%
Total number of sorting responses made	.....	
Number correct	.....	.....%
Number incorrect	.....	.....%
Total number of questions asked or utterances made	.....	
Number of these relating to sorting attributes	.....	.....%
Number of these relating to global rule statements	.....	.....%
Number of these that involved actual use of at least one attribute label	.....	.....%

APPENDIX B

Preliminary to Phase One

With the child present the experimenter 1) checked through the mailed back information on the Permission Form, verifying and clarifying same; and 2) asked the questions required to complete the Phase One Information Sheet. The child was then sent out of the room while the experimenter explained the block sorting task to the mother.

(Inverted box removed to reveal piled-up blocks)

It's a straight forward sorting game. The idea of it is that starting with the blocks as they are there...

(Experimenter began sorting the blocks)

that you end up...

(Experimenter completed sorting)

with them all grouped and separated like that. Now there's no one particular way that they have to be stacked up, or anything like that. Just so long as there are the four distinct groups separated out.

What we want you to do is to teach it to (child's name).

Now first of all I should stress to you that it's not a test. We're not trying to find out if he/she can do this with you telling him/her the least amount of information or anything like that. What we want is a sample of you and him/her doing something together.

So really the blocks are just something for you to do. So you just act naturally and do whatever you would if you were at home and wanted him/her to sort the blocks out like that.

Now, are there any questions that you have?

(Experimenter answered any questions that the mother asked by rephrasing the preceding instructions, and perhaps by redoing the sorting demonstration)

Now, I'll just get them sorted back.

(Experimenter re-stacked the blocks and replaced the inverted box)

We're going to be puting this on video tape so that

we can look at it later on in our own time. The camera is up there in the corner.

(Experimenter pointed out the video camera)

Now, I have a number here that I'll get you to hold up so that we can identify your section of taping.

(Experimenter demonstrated how to hold the cue sheet)

I'll tap on the window when the number is on tape. So, when you hear me tapping you can just put the sheet down and start.

(Experimenter ushered the child back into the experimental room and then went to the observation room)

User Documentation for DISCS Program

The DISCS course administers two visual discrimination shift tasks, both under a total change paradigm. The pre-shift section of the first shift task uses color and shading pattern as the two potentially relevant stimulus dimensions; the relevant cue being one of "red", "blue", "vertical pattern", or "horizontal pattern". The post-shift section of the first shift task uses the same stimulus dimensions but different cues; namely "yellow", "green", "diagonal pattern", and "diamond pattern".

In the pre-shift section of the second shift task the stimulus dimensions used are "shape", and "number"; the cues being "circle", "triangle", "one", and "three". The post-shift section uses the same dimensions but new cues; namely "diamond", "cross", "two", and "four".

With four possible routes through each section of each shift task, as determined by the selection of the respective positive stimulus cues, there are thus 256 (ie. 4x4x4x4) different routes through the whole DISCS course.

In the first shift task each of shape, size, and number are within-task constant dimensions. In the second shift task each of size, color, and shading are within-task constant dimensions. Position is a within-task variable irrelevant dimension in both shift tasks. The

order of stimulus presentation in both tasks is a Gellerman series in order to minimize the possibilities of successful extraneous response strategies. The criterion for success and shift in both tasks is ten consecutive correct responses.

Stimulus presentation is via the image projector, and correct response feedback is given by a one second beep tone via the taped audio system. The response mode uses the light pen and a pattern on the CRT screen which is similar in layout to the stimulus presentation via the image projector. The subject indicates his choice of stimulus by pointing to the same relative position on the CRT pattern that is occupied by the stimulus on the image projector screen.

The first section of the course consists of typing information into the computer to both identify the subject and to determine the route taken through the course. This first section would typically be completed by the experimenter.

Upon completion of this first section, an example stimulus presentation appears on the projector screen, the response pattern appears on the CRT, and the course stops indefinitely. This allows the experimenter to give any required individual tutoring to subjects on, for instance, the general format and procedure of the shift tasks as well as the response used.

To re-start the course "start" is typed in. The CRT pattern for this part of the course is identified by the appearance of the cursor at the top left of the CRT screen.

The next section of the course involves the administration of a short tutoring sequence designed to teach the subject the response mode and to explain the requirements of the tasks. Depending upon the level of the subject, this sequence may be sufficient and the individual tutoring allowed by the preceding pause segment would thus be unnecessary.

During this tutoring sequence, if a subject persistently makes the same error he is given a voice message telling him to put up his hand and await assistance. The course stops, and a message identifying the error made is typed onto the CRT screen. These messages are as follows:

Help01 subject has failed to select the red picture.

Help02 subject has failed to select the vertically patterned picture.

Help03 subject has failed to select the blue picture.

Help04 subject has failed to select the horizontally patterned picture.

Help05 subject has failed to select the horizontally patterned picture during "beep" training.

To restart the course after one of these "help" pauses, type in "start".

Following completion of this tutoring sequence, the subject is administered the first shift task. When this first task is completed a voice message tells the subject to take off his earphones and await directions from the experimenter. The course stops. This between-task pause allows for any intervening training conditions that may be required. To restart the course type in "start" and the subject's name. This will cause the second shift task to be administered, preceded by a brief introductory sequence designed to remind the subject of task and response procedures. Upon completion of this second task the same voice message that followed the first task is played.

If at any time the subject makes an unrecognizable light pen response a voice message reminds him of the response mode and directs him to try again.

As well as the response latencies, response identifications, and the times of responses which are recorded automatically by the computer for each response by each subject, the following counters store the following scores:

	Shift task #1		Shift task #2	
	Pre-shift	Post-shift	Pre-shift	Post-shift
Total correct responses	c1	c4	c7	c10
Criterion count	c2	c5	c8	c11
Total wrong responses	c3	c6	c9	c12

Counter zero is a system counter, and counter 13 is used in the course as a branching indicator for the computer. Thus neither of these two counters have any performance relevance. Similarly, none of the switches have any performance relevance since they also are used only as branching indicators for the computer.

The print-out response identifiers are defined as follows:

CA = correct answer

WA = wrong answer

UU = unrecognizable answer

The print-out stimulus identifiers (the "epp" identifiers) are each three digit numbers indicating the position of that stimulus frame on the film strip used in the projector. Since the very first response made in the course is the typed in subject's name, each print-out for each subject will be easily identifiable.

Macro Used in DISCS Programming

```
fp0 $01
dt  6,6¬/6,6¬/40,0¬/b2
dt  12,6¬/6,12¬/40,0¬/b2
dt  18,6¬/6,18¬/40,0¬/b2
dti 0,19¬/32,0¬/1,19¬/b3
fp1
epp 9999¬/$01
nx
br  re
cap 18,6,8,$02¬/ca
de  0¬/32
aup 486,1¬/23
no  the preceding aup is a one second beep
    correct response signal
ad  1¬/c$03
ad  1¬/c$04
br  postsh¬/c$04¬/e¬/10
wap 18,6,8,$05¬/wa
de  0¬/32
pa  10
ad  1¬/c$06
sb  c$04¬/c$04
br  pr1
un
```

```
aup 486,0~/55
no  the preceding aup instruction is a "try
    again" message
br  re
ea
prr
au  486
```

The macro variables used were as follows:

$01 = frame number of filmed visual stimuli
$02 = start column for the cap instruction
$03 = number of the counter to be used for total correct
$04 = number of the counter to be used for the criterion correct count
$05 = start column for the wap instruction
$06 = number of the counter to be used for total wrong

DISCS Preliminary Instructions for Task-1

#1 Hello. Today we are going to play a little game, during which some pictures well be shown on the screen in front of you. Each time there will be two pictures. What you have to do to win the game is to choose, each time, the picture that is correct. In each pair of pictures it will always be the same thing that will tell you which picture is the correct one. Before we start, let's try everything out so that you will know exactly how to play the game. Here are some pictures.

(UA130 frame #136 comes onto the projection screen and the CRT shows the response-blank pattern)

#2 On the TV you will see that there is a line down the middle with a square on each side, just like on the screen with the pictures. Let's suppose that you think the red picture is correct. To choose it you press the end of the pointer onto the square on the TV that is on the same side of the line as the red picture is. Do that now.

(Pause. If subject chooses correctly go to #3; if incorrectly then to #4)

#3 That's good.

(Go to #6)

#4 No, you pressed the wrong square. Look back at the

pictures. Now, press the TV square that is on the same side of the line down the middle as the red picture. Do that now.

(Pause. If the subject chooses correctly go to #3; if incorrectly then to #5)

#5 No, you still haven't got it. Put up your hand and someone will come and help you.

(Stand-by. Go to #6 when experimenter restarts)

#6 Okay, now let's try a different one. Suppose you wanted to pick the picture with the standing-up lines. Press the pointer onto the TV square on the same side of the line as that picture. Do that now.

(If subject correct go to #7; if incorrect go to #8)

#7 Very good.

(Go to #10)

#8 No, you pressed the wrong square. Remember, to choose the picture with the standing-up lines you press the TV square on the same side of the middle line as the picture is. Now, try again.

(If subject correct go to #7; if incorrect go to #9)

#9 No, you still haven't got it. Put up your hand and someone will come and help you.

(Stand-by. Go to #10 when experimenter restarts)

#10 Suppose you thought the blue picture was correct. Press the TV square that would choose that picture.

(If subject correct go to #11; if incorrect go to #12)

#11 Good.

(Go to #14)

#12 No, try again. Pick the blue picture.

(If subject correct go to #11; if incorrect go to #13)

#13 No, you still haven't got it. Put up your hand and someone will come and help you.

(Stand-by. Go to #14 when experimenter restarts)

#14 Okay, now choose the picture with the lying-down lines. Do that.

(If subject correct go to #15; if incorrect go to #16)

#15 Very good. It looks like you can choose pictures okay.

(Both screens go blank. Go to #18)

#16 No, try again. Choose the picture with the lying-down lines.

(If subject correct fo to #15; if incorrect go to #17)

#17 No, you seem to be having a bit of trouble. Put up your hand and someone will come and help you.

(Stand-by. Go to #18 when experimenter restarts)

#18 Now, before we start the game there is one more thing you should know. Each time you choose the correct picture you will hear a beep in your ears. Like this ...(a beep sounds)... This will mean that you are winning the game. If you don't hear the beep then it will mean that you chose the wrong picture. Let's see how it all works. Here are some more pictures.

(UA130 frame #139 comes onto the projection screen and the CRT shows the response-blank pattern)

#19 Let's pretend that the picture with the lying-down lines is correct. You go ahead and choose it.

(If subject correct go to #20; if incorrect go to #21)

#20 ...(beep)... There, because you chose the correct picture the beep sounded.

(Both screens go blank. Go to #24)

#21 No, you chose the wrong one. Remember we're pretending that the picture with the lying-down lines is the correct one. Try again.

(If subject correct go to #20; if incorrect go to #22)

#22 You still seem to be having a bit of trouble. Put up your hand and someone will come and help you.

(Stand-by. Go to #23 when experimenter restarts)

#23 Okay, let's try again. Choose the picture with the lying-down lines because that's the one we're pretending is correct.

(If subject correct go to #20; if incorrect go to #22)

#24 Okay, I think you are ready to start the game. Remember, if you hear the beep then it means that you were correct and are winning; if you don't hear the beep then it means that you chose the wrong picture and are losing. As each two pictures shine on the screen, look at them carefully and decide which of the two you think is correct. When you have decided,

choose that picture by pressing the TV square that is on the same side of the line as your picture. Don't worry about going too fast. The next two pictures will not come on until after you have made your choice. Okay, let's start. Try to win the game and see if you can get all your choices correct. Here are the first two pictures.

DISCS Preliminary Instructions for Task-2

#1 Hello again. Let's play another game like the one we played before. The rules will be the same in this game as in the last one. The only thing different will be the pictures used. Here are two of them.

(UA130 frame #144 comes onto the projection screen for five seconds and then the screen goes blank)

#2 Just as before, if you choose the correct picture then you will hear a beep. If you do not hear the beep then it will mean that you chose the wrong picture. To show which picture you have chosen, you will use the TV screen and the pointer just like before. To win the game you have to try to get every choice correct. Remember, it will be the same thing each time that will tell you which of each two pictures is correct. Okay, let's start. Here are the first two pictures.

Training Film Script

The following is the script for the training film used in phase two. The film showed an adult model solving a discrimination problem similar to that which constituted the pre-shift section of task one. The camera angle was directed over the shoulder of the model.

(The first stimulus pair comes onto the projector screen)

It's always going to be the same thing that's correct everytime, so let's see how the pictures are different. There are different colors, red and blue; and there are different types of lines, standing-up lines and laying-down lines. Choose blue first.

(Model selects the blue stimulus. The beep does not sound and the next stimulus pair is presented)

No beep, it can't be correct. Try the other color, red, and see if it's correct everytime.

(Model selects the red stimulus. No beep sounds and the next stimulus pair is presented)

No, it's not correct either. Let's try the lines. Let's try the standing-up lines and see if they are correct. There they are, standing up lines.

(Model selects the vertically patterned stimulus. No beep sounds and the next stimulus pair is presented)

No beep, they can't be correct. Try the laying-down

lines and see if they are correct everytime. There they are.

(Model selects the horizontally patterned stimulus. The beep sounds and the next stimulus pair is presented)

That's it. The laying-down lines. Choose it again.

(Model selects the horizontally patterned stimulus. The beep sounds and the next stimulus pair is presented)

Always correct, the same thing.

(Model selects the horizontally patterned stimulus. The beep sounds and the next stimulus pair is presented)

It's always the laying-down...

(Model selects the horizontally patterned stimulus. The beep sounds and the next stimulus pair is presented)

The laying-down lines. Choose them again.

(Model selects the horizontally patterned stimulus. The beep sounds and the next stimulus pair is presented)

They're always correct.

(Model selects the horizontally patterned stimulus. The beep sounds and the next stimulus pair is presented)

It's always the same.

(Model selects the horizontally patterned stimulus. The beep sounds and the next stimulus pair is presented)

Always the laying-down lines.

(Model selects the horizontally patterned stimulus. The beep sounds and the next stimulus pair is presented)

The same thing every time.

(Model selects the horizontally patterned stimulus twice more, the beep sounding each time)